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INDEX NUMBER

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On Page 10

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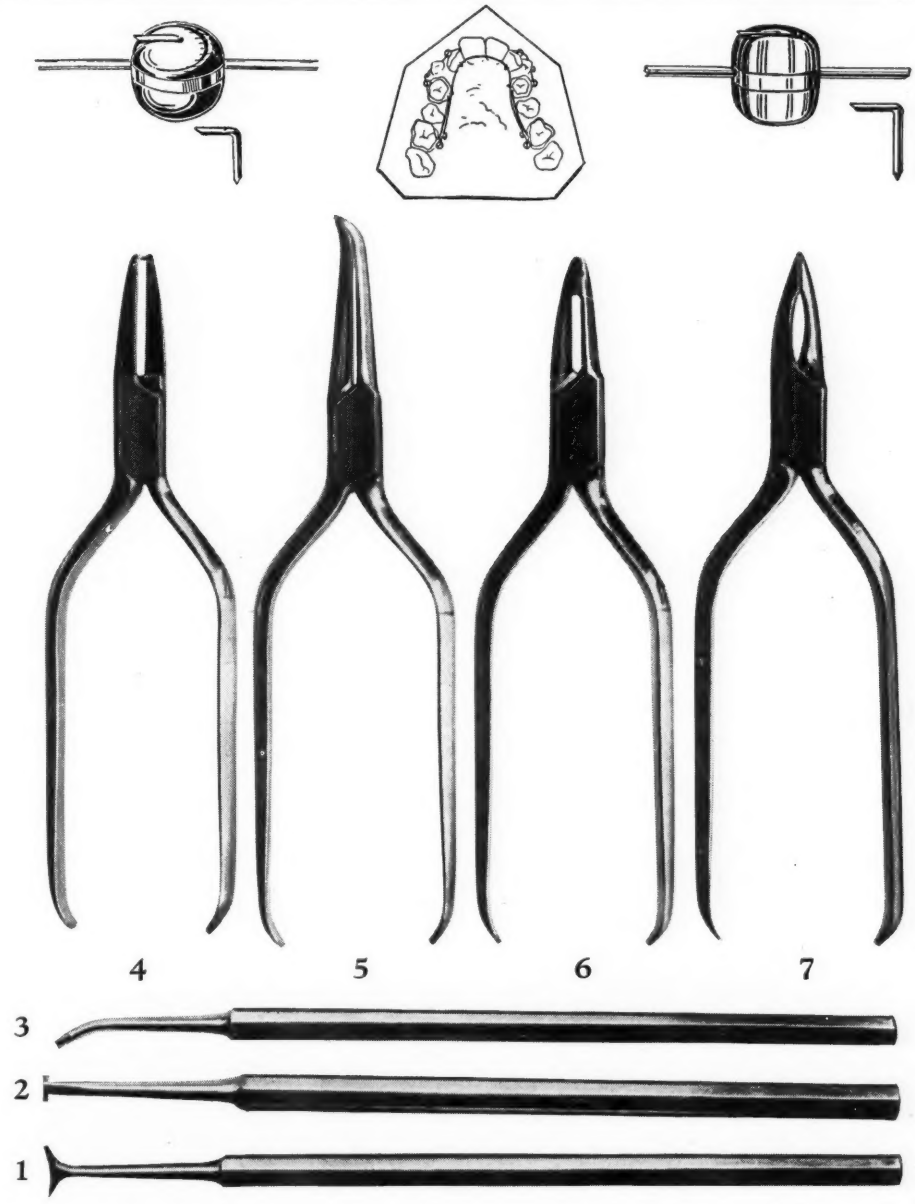

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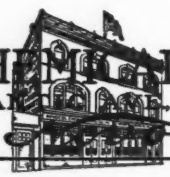

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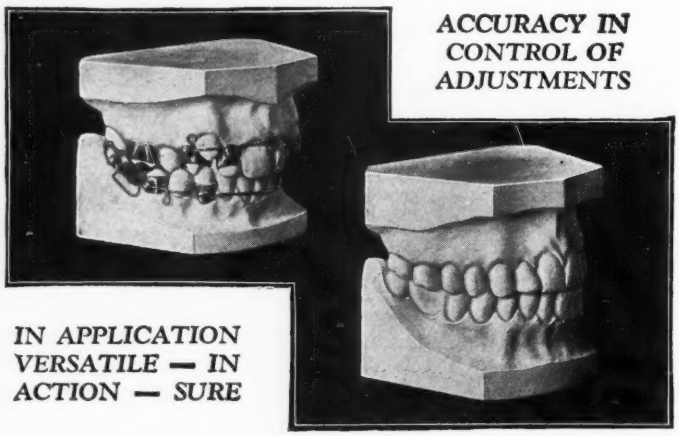

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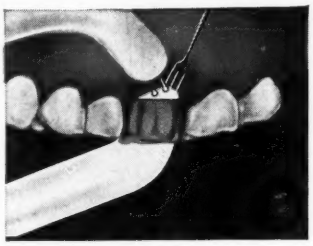

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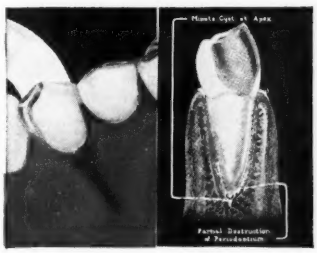

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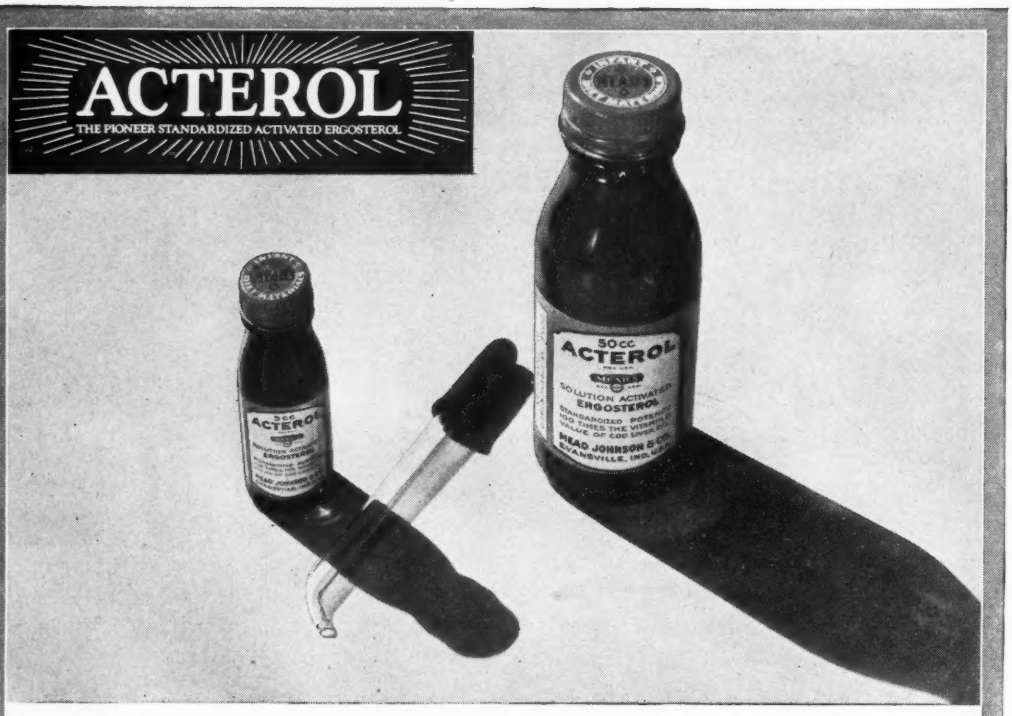

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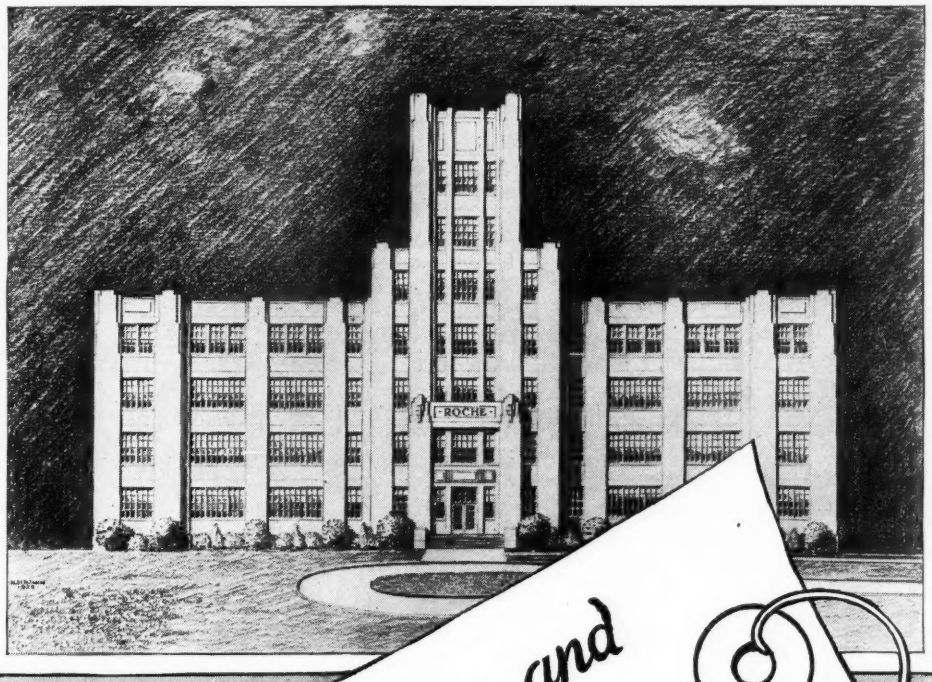

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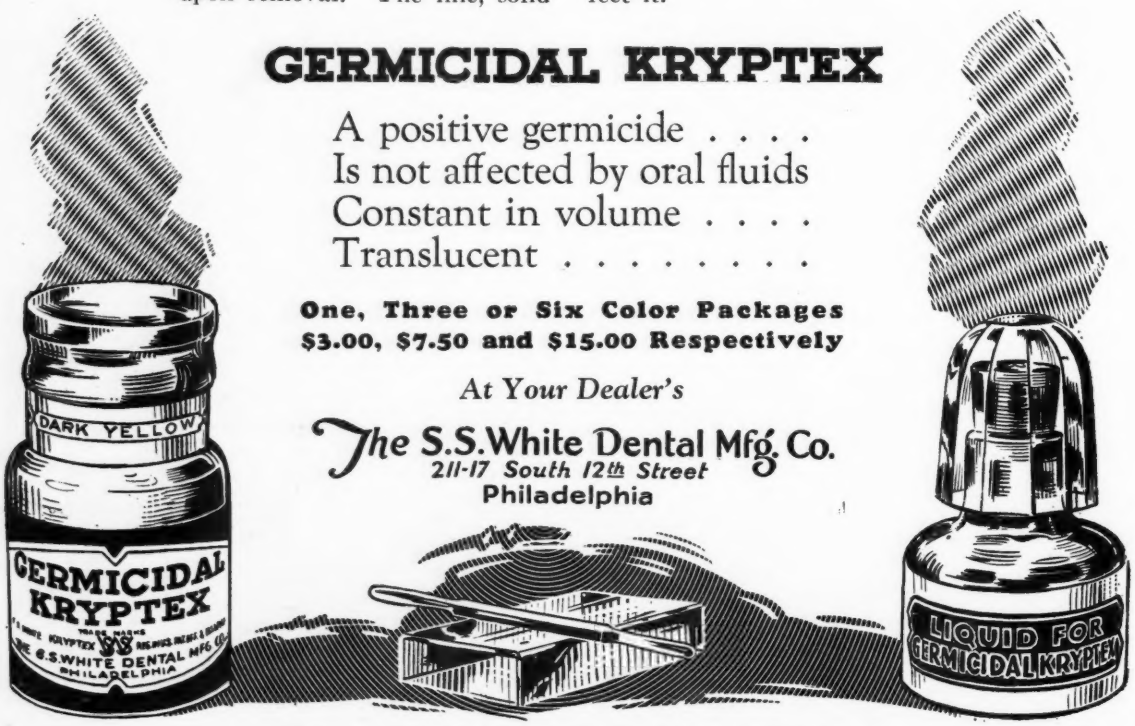

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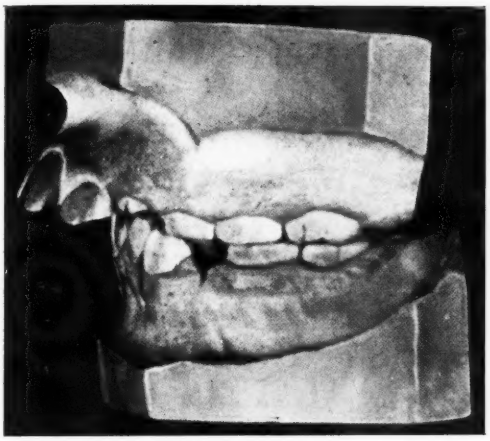

Figure 1

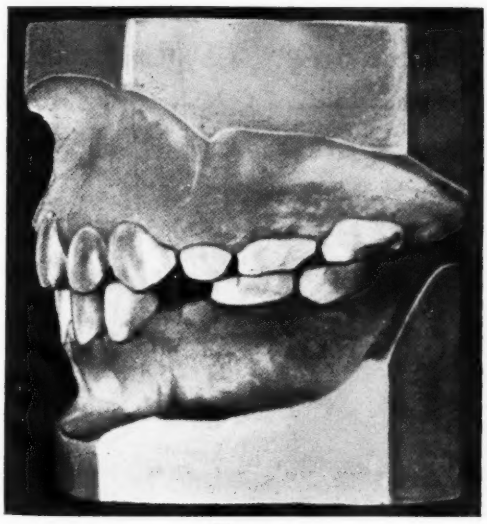

Figure 2

THE case illustrated in Figure 1 is a typical example of Class II Division 1. Figue 2 shows the results obtained by treating this case with the Tiny Ribbon Arch together with the Alignment Bracket and Tie Bracket Bands. The upper arch has been shortened and widened, there is a full restoration of the upper teeth to their normal, upright positions, all in slightly more than five months' time.

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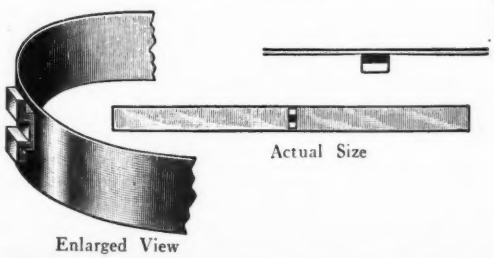

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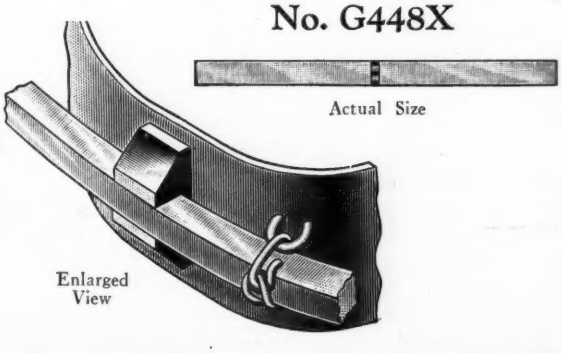

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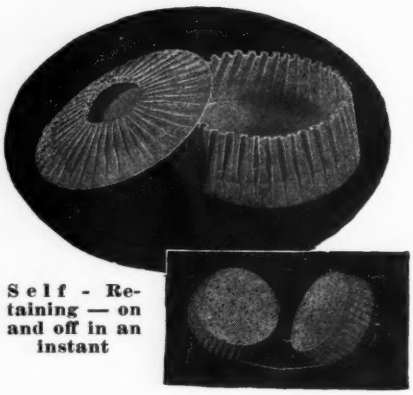

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A Popular Introduction to Dietetics

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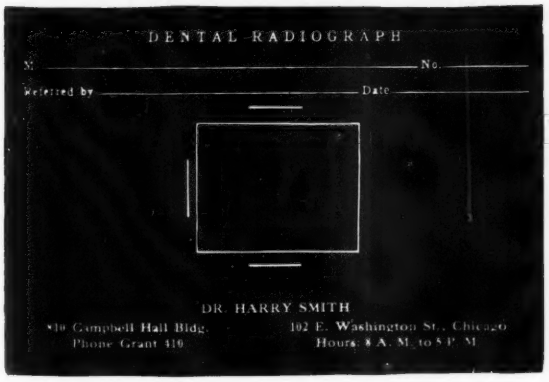

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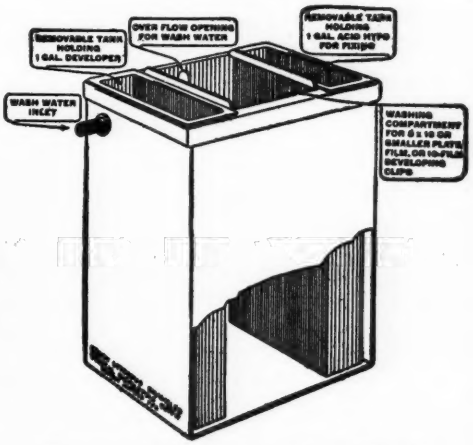
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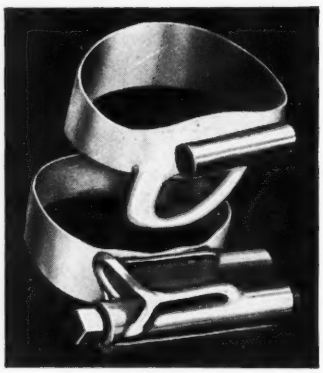

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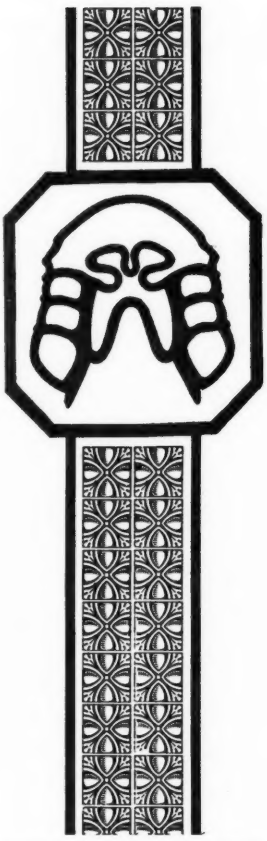

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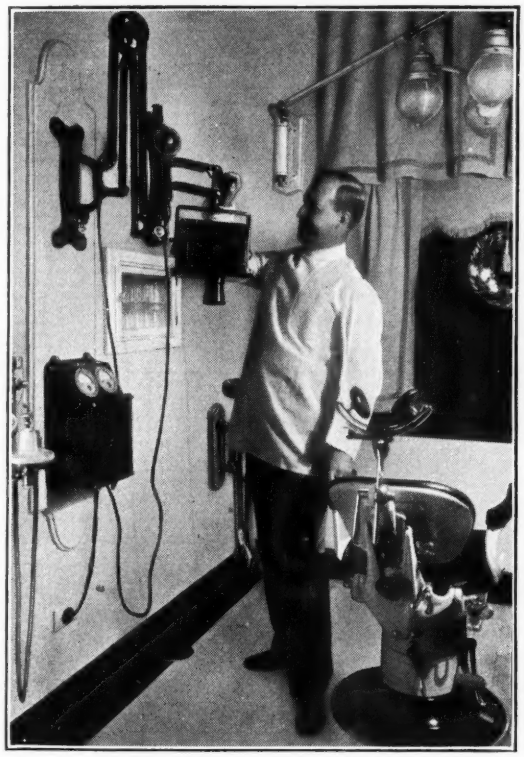

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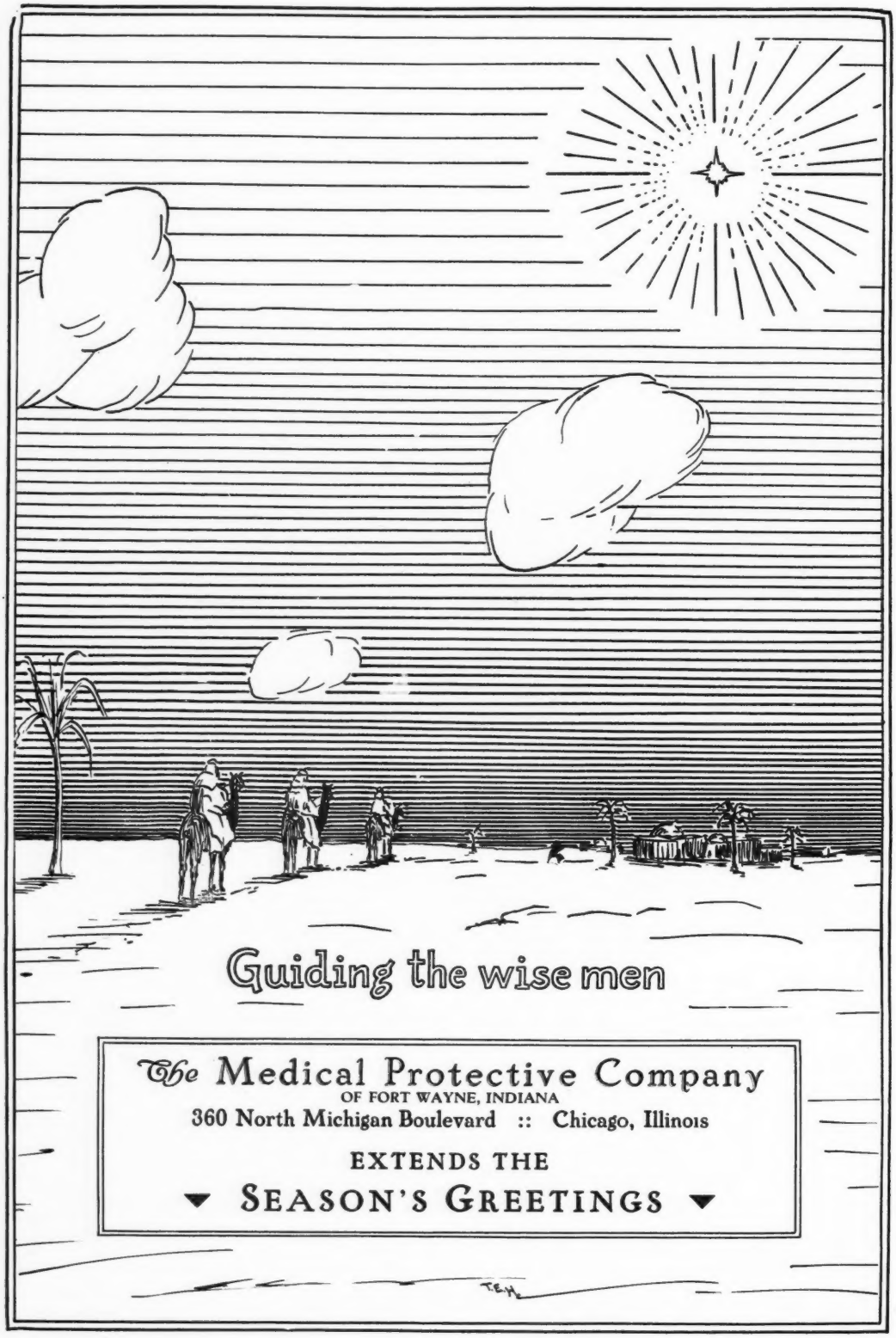
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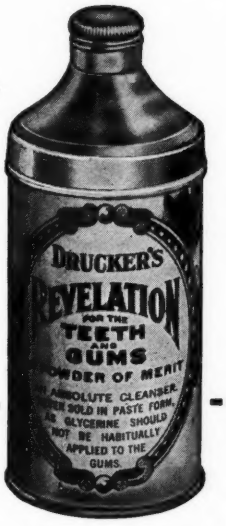

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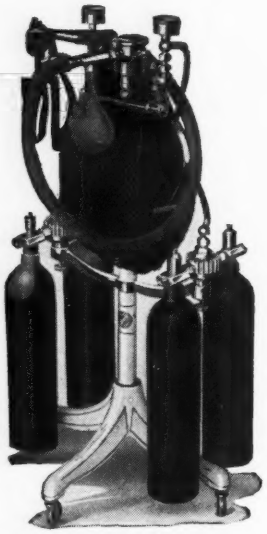

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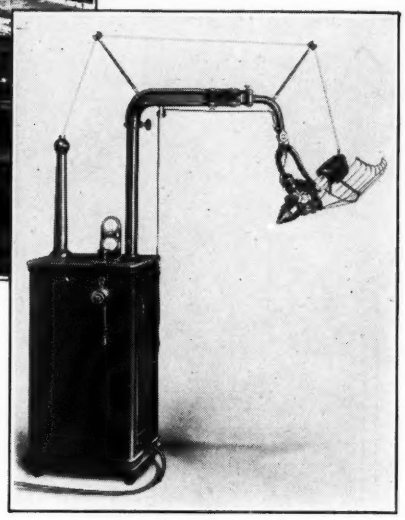

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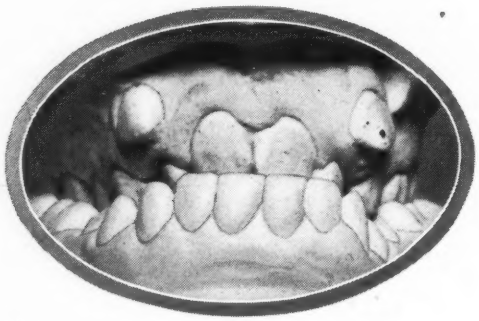

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VOL. XV ST. LOUIS, DECEMBER, 1929 NO. 12

ORIGINAL ARTICLES

RECENT STUDIES IN THE DEVELOPMENT OF THE FACE*

BY T. WINGATE TODD, F.R.C.S.(ENG.), CLEVELAND, OHIO

PRINCIPLES OF BONE GROWTH ESTABLISHED BY JOHN HUNTER

THE power of certain dyes to stain some elements in the living body is known as the principle of vital staining. It was the publication by John Belchier in 1736 of the effect of feeding madder to growing animals which first introduced the scientific world to this phenomenon. John Belchier had been dining with a friend, a calico printer in London, and had noticed at table that the bones of the joint were stained red in places. Upon inquiry of his host he learned that the pig had been fed upon madder-soaked bran which had previously been used for dyeing the calico in his host's factory. John Belchier merely recorded this observation: it was a Frenchman, Duhamel, a market gardener, who first realized its significance. He discovered that only the growing parts of the bone were stained. John Hunter used the method to confirm observations which he had already made without recourse to vital staining. We are indebted to Hunter for first pointing out that bone growth involves not merely additional structure but also abstraction of tissue. He noted for example that the last milk molar lay at the root of the ascending ramus of the mandible but in the adult jaw room had been found for the additional three permanent molars between the site of the last milk molar and the ascending ramus. He could not imagine how the additional definite space could be obtained unless the mandible had been remodeled during growth. It is this remodeling which is so important for our present discussion and although remodeling is obvious in all bones there is no part of the skeleton in which it is more marked a feature than in the jaws, upper and lower. Hunter's experiment has been repeated in recent years but the method has not resulted

*From the Hamann Museum, Laboratory of Anatomy, Western Reserve University.

Fig. 1.—Left side of jaws. W.R.U. 315, Male, white, 27 years old. Localized defect of growth involving alveolar process of maxilla and mandible. Most pronounced around M1. Retained upper canine and second molar of milk dentition.

Fig. 2.—Full face of skull. W.R.U. 391, Male, white, 18 years old. Normal dimensions of adult skull and eruption of permanent dentition, but retention of proportions and contours of child of twelve months.

in that enlightenment which we might have hoped because those who have used it did not press the investigation as far as they might and they also had not prepared their minds by that long study and careful observation of the phenomena which can be seen by the naked eye as Hunter had done. I am going to trace for you step by step the progress which we have made in Cleveland in the elucidation of the principles of growth of the jaws.

INDICATIONS DERIVED FROM THE STUDY OF DEFECTIVE GROWTH

The first skull which I present to you has a defect in growth involving merely the cheek teeth and alveolar processes of the jaws containing them. It is to be observed that the premaxilla with its contained incisors and the corresponding part of the mandible are quite normal. The defect involves

Fig. 3.—Left side of face. Skull W.R.U. 391. Male, white, 18 years old. See legend for Fig. 2.

the maxilla proper and the corresponding part of the mandible. Examination of the right side shows that the alveolar processes of both upper and lower jaws have not grown as they should and the teeth, especially the second premolar and the first molar, are far from their natural planes of occlusion. On the left side the defect has gone a stage further for here the maxillary milk canine and second milk molar have been retained. It is but natural to associate this with the defect in the alveolar process. Probably both are the result of some common cause.

Defect of course may not be localized but may involve the entire face. Such a specimen is now before you, flanked on the one side by a normal skull of the same age and on the other by the skull of a small child of about one

year. Notice that although the central skull has even surpassed the dimensions of the normal skull of eighteen years yet its form is singularly like that of the face of the little child. When we examine the skull in detail we see that the cranium is very large and rounded, quite out of proportion to the size of the face. We see that the orbits are large and also very large for the face. There is practically no distance between the floor of the orbit and the sockets of the teeth. The zygoma on each side is underdeveloped. Although the permanent teeth have erupted the jaws do not resemble adult jaws in the slightest. The lateral view shows even more strikingly the fact that in spite of increasing size both upper jaw and lower jaw have retained

Fig. 4.—Left side of face. Skull W.R.U. B1414. Cast of skull of Basuto woman. Female, negro, 32 years old. Microcephaly. Cranial capacity 340 c.c. Large mask (face and palate) hafted to tiny cranium.

very definitely the characters of the infant. There is practically no angle to the mandible or growth in the ramus: it is typically that of an infant.

The conclusion that we draw from the examination of the two foregoing skulls is the conclusion which Hunter drew, namely, that growth consists of two processes, addition of substance and abstraction of substance. Bone is constantly changing in its modeling. We must not be misled by the hardness of bone into thinking of it as something permanent like marble or cement. It is a living tissue subject to constant change. It undergoes processes of metabolism like the other tissues of the body. So whenever we consider growth we must not regard it as purely increase in dimension. We must think of it also as a process of remodeling, of erratic dimensional increase in this area or that and consequent necessary adjustment of the various parts.

Of this harmonizing or adjusting influence we get very clear indication from the study of the next two skulls. Of these the first is that of a little Basuto woman, a microcephalic idiot whose cranial capacity was only 340 c.c. instead of the normal 1340 c.c. In spite of the fact that her cranium is so very small the face is very nearly of normal size and the jaws are quite as large as one would expect in a woman of her height. Some adjustment has obviously occurred to enable the large jaws to be fitted on to such a small brain case.

A rather different condition is to be observed in the next skull, No. 337. This also is the cranium of a microcephalic idiot although this time cranial capacity is 970 c.c. One might expect that if normal-sized jaws could be

Fig. 5.—Right side of face. Skull W. R. U. 337, Male, white, 31 years old. Microcephaly. Cranial capacity 970 c.c. Normal mandible articulating with normal-sized maxilla which however is hampered by its anchorage to abnormally small cranium.

hafted on to such a small skull as that of the Basuto woman it would be possible to haft normal jaws on to a skull the size of this one. As the adjusting force was not working with perfection as in the last, the upper jaw has been anchored back on the small cranium. The mandible alone has grown to its full size. Consequently an upper jaw which is practically normal in appearance is held back so that the occlusion of the teeth could not take place.

Now one could not look at these skulls without realizing two important facts. The first is that cranial growth is not uniform. It is localized here and there: it does not occur in all parts at the same time. The second important fact is that in order to permit this local discontinuous growth there must be considerable adjustment. Therefore we may look for areas in which

increase in dimension is the predominant feature and other areas in which adjustment between adjacent areas exhibiting various degrees of growth takes place.

PRINCIPLES OF GROWTH IN THE MAMMALIAN FACE

In order that we might make observations on the phenomena of growth in the skull we choose an altogether different animal, namely the hyaena. My colleague, Mr. Schweikher, has worked upon this creature for two years and he has shown that in the hyaena skull there are three areas in which growth is especially marked. These three areas are the occipital region, the premaxillary region and that area of the maxilla which carries the last premolar, the large carnassial tooth which is characteristic of the Carnivore skull. Mr. Schweikher has made a series of drawings accurately scaled showing the superposition of the skull of a half grown hyaena upon that of a fully adult animal. The first point to notice is that the dorsal contour of both these skulls is the same. If one could imagine an expansion after the manner of an expanding sponge the contour of the smaller skull would reach in almost exact detail the contour of the larger skull. In other words there is no change in proportions of the face or cranium in the hyaena, and this animal therefore is a very good one for our purpose. We are not confused by nicety of cranial or facial growth. By superposition of the young skull upon the adult we are able to analyze the places where increase in dimensions occurs. It will not do just to put the drawing of the young skull over the drawing of the adult skull and hope by this simple process to obtain all the information possible. It is necessary to superpose different areas to realize the growth in premaxillary area, in carnassial area and in occipital area. We are thus able to satisfy ourselves of the stationary condition of occiput, of premaxilla and of carnassial area after the skull is half grown. Thenceforward there is increase in dimension in three other areas, namely the maxillary area, the coronal area and the lower orbital area. These, of course, are sites of sutures. Mainly, however, the later increase in dimension is in the region of the cranial base at the site of hafting of the face.

Now it would not do to stop after we have examined the lower mammals. It is necessary to carry on this investigation among the Primates and especially among the Anthropoid Apes if we are to gain any information regarding Man. This has been done by my colleague, Doctor Krogman, and he has shown quite clearly, though I will not trouble you with the details, that the growth of the Anthropoid cranium is along lines closely similar to those of the human skull.

At the same time that Doctor Krogman was working on the Anthropoid skulls, Miss Tracy had been making observations on the growth of the human skulls. It is true that Miss Tracy's results were obtained before those of Doctor Krogman and they seem so extraordinary that for a long time we could hardly believe that they were correct. We now know that we made no mistake. In general the contour of the human cranium changes very little with growth and the places where it does change are in the forehead and the extreme back of the head where this is formed by the lower part of the occipital bone beyond the back of the foramen magnum. As the child grows the

parietal bone grows forward until somewhere about the age of ten when no further forward growth occurs at the coronal suture. In succeeding years the parietal bone grows backward and at the same time the frontal bone tilts so that what was once the most prominent part of the forehead is now less prominent than the lowest part of the frontal known as the glabella. The tilting of the orbit is very clearly seen along with the tilting of the frontal bone. The

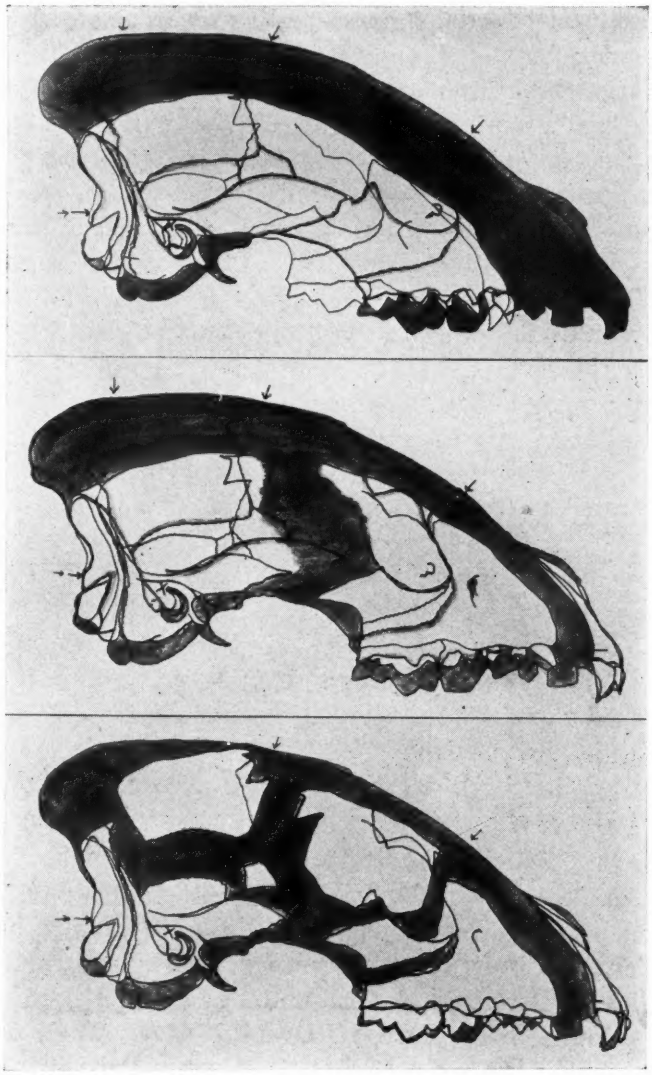

Fig. 6.—Analysis of growth of hyaena skull by F. P. Schweikher. Superposition of skull of Crocuta crocuta (spotted hyaena) B782, half grown, upon skull B1201 adult. Arrows indicate comparable landmarks. Top figure shows general comparison of size. Middle figure indicates that main growth has occurred in frontal area of cranium hafting mask to brain case. and also in premaxillary-maxillary region. Lowest figure shows detailed comparison of identical areas to demonstrate actual localized growth.

occipital bone meanwhile is bulging out more. While these changes are occurring in the cranium much simpler changes are taking place in the face. Its growth can be divided into a vertical component and an antero-posterior component. Before we go on to that, however, it is necessary to learn what is the human dental plan and this will be the next feature of our investigation.

PRINCIPLES UPON WHICH THE HUMAN DENTAL ARCH IS BUILT

It has often been asserted that the modern human dentition is undergoing degenerative changes. In support of this contention it is common to point to the last molar tooth, to the erratic character of its presence and its size, to the relatively small size of the canine tooth and to the frequent anomalies in size at present of the lateral incisor. It is common also to point to defects in occlusion which are so frequently found in certain of our generation and of the generation ahead of us. It is scarcely ever remembered in connection with faults of occlusion that the generations just referred to are those which show most clearly the effects of urbanization before the adequate development of public health and social hygiene. We shall not find such occlusal defects in the generation which is now growing up, whose teeth have been so carefully looked after during the school period. Nor, indeed, am I able to see any justification for the contention that wisdom tooth, canine or lateral incisor indicates a degenerative process going on continuously in the modern human jaw. The third molar is the last tooth of the series. It is well recognized that the mandibular wisdom tooth does not suffer change in size to any degree. It may, however, be absent. The upper wisdom varies in size and sometimes is represented by a mere stump tooth. This, however, is not really the wisdom tooth at all but a paramolar which has come into position through the absence of the wisdom tooth itself. It is quite characteristic of the majority of mammals and certainly of the most primitive forms of mammals that the last tooth of the row is the smallest, especially in the upper jaw. Alternate occlusion is the pattern in other mammals as well as in Man and therefore the last upper molar occludes only with the hinder part of the last lower molar. It is clear then that smallness will characterize the upper last molar more than it will the lower last molar. It is only in animals which have secondarily increased the size of their last molar that we find the condition so often assumed to be the primitive one. Such animals are the elephant, the pig and to a less extent the baboon and the gorilla. These animals do not show a primitive condition of the last molar but rather a very specialized one.

The canine tooth is not a long tooth developed especially for flesh tearing. It is a dental guide and is called forth by elongated jaws. We find long canines in animals which have a purely flesh diet, it is true, but we also find them in animals which live exclusively on fruit with hard rinds as the Orang-outan does. The longest canine teeth for the size of the skull in any mammal today are to be found in the head of the musk deer. These are a secondary enlargement of which the purpose is not known. Primitive mammals have long canine teeth to function as dental guides for the long jaws.

Anomalies of the lateral incisor result from the fact that this tooth lies so close to the suture between the premaxilla and the maxilla proper. Its dental rudiment may be split. The tooth may be very small or even absent. Its condition is no indication of an involution going on, especially in the modern human jaw.

There is no better indication of the relation between change in dental pattern and change in jaw form than that given by the Bandicoots. These are Marsupials from Australia. There is one of them, namely Perameles which has

a very primitive form of tooth pattern. There is another called Thalacomys, the cheek teeth of which have become long crowned, have lost their spikiness, have become rounded in their occlusal outline and from which some cusps have disappeared never again to return. Coincidentally with these changes in the molars and with reduction in the size of the premolars we observe changes in the form of the jaws and in the condition of the hafting on to the jaws of the middle root of the zygoma. I will enlarge on this phenomenon. It is enough to use it as an illustration on the fact that changes in the dentition go hand in hand with changes in the shape of fixation or fitting of the jaws in the face.

Fig. 7.—Comparison of mandibles of Bandicoots. Left figure is from primitive Bandicoot W.R.U. B773, Perameles nasuta. Right figure is from specialized Bandicoot W.R.U. B185, Thalacomys minor. Note the elongated crowns and blunt cusps with modification of the W-shaped configuration which are characteristic of the specialization of Thalacomys. Note also the small last molar in both jaws.

Now to return to the plan of human dentition, if I were asked what is the most striking feature of the human dentition in contrast with the dentition of the Anthropoids I should say at once the size and predominance of the first molar. It is not the time of eruption of the first molar which matters. That occurs first of the permanent teeth in all the Anthropoids as well as in ourselves. It is the size of the tooth which is so important in the human dentition. It is curious also that this tooth should be so subject to caries and it is well known that the loss of this tooth results in a very marked disorganization of the occlusion pattern of the jaw. It is quite common for the second lower human molar to have only four cusps but it is characteristic of the first to

have five cusps and the first is never smaller than and nearly always larger than the second. This is true of the upper jaw as it is of the lower jaw. When we look at the teeth of a child of say ten years we observe that the first permanent molar is much larger than the second milk molar, so that the milk dentition increases in size as it were up to the first permanent molar and the permanent molars decrease in size from the first to the third.

The situation is quite different in the Anthropoid Ape of which we shall take the Gorilla as an example. But before we examine the Gorilla itself, let us examine the dentition of the earliest known Anthropoids. Of these the most important is a little mandible which belonged to a beast now going under the name of Propliopithecus. The animal lived in the Oligocene period. We know nothing of it but the mandible, nevertheless from this fragment of the skeleton we can reconstruct fairly well what must have been the condition of

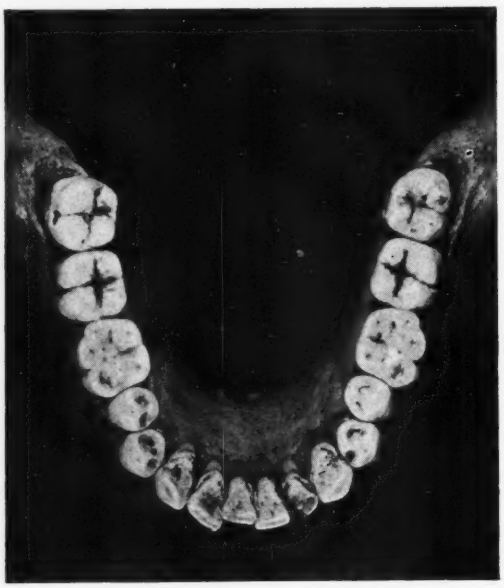

Fig. 8.—Typical modern mandibular permanent teeth of Man. W.R.U. 601, Male, white, 30 years old. Note five-cusped very large M1, four-cusped smaller M2 with typical "human cross," and still smaller M3.

the jaws. The tooth row in the mandible is not long, the canine tooth does not project very much, the premolars are singularly like human teeth and so indeed are the molars. The last molar is the smallest of the three; the first and second are almost equal in size. All the molars have rounded contours and their cusps are low, rounded and fairly equal in size as are those of the human molars. I have already spoken about the value of the canines as dental guides in their relation to long jaws. I have also mentioned that the canines may be secondarily enlarged in instances of special function. The importance of this mandible is that here we have a dental pattern which could equally well develop in the human dental pattern or into that of the Anthropoid Ape. In the former the first molar increases in size and the second becomes smaller. In the development toward the modern Anthropoid Apes, the first molar did not increase markedly in size but the second and even the third did.

From India come certain fossil Anthropoid Apes which belong to a later period than Propliopithecus, namely the Miocene. The name which has been given to these extinct primates is Dryopithecus. Three Indian species have been discovered. With one of these, of which no more than the symphysial part of the mandible with its contained teeth remains we have nothing to do, but two others vitally concern us. Of these the first is Dryopithecus cautleyi. In this animal there is a long canine tooth for the jaw which is increasing in length. The first premolar has become somewhat caniniform. The second premolar retains its somewhat molariform pattern. The first molar is not at all unlike the first molar of Propliopithecus. The second molar is large. So also is the third molar. The cusps have become crystalline and clear-cut in character like those of the Gorilla. This peculiar character of the cusps and the elongation of the second and the third molars are even more characteristic of another specimen, Dryopithecus frickae. From

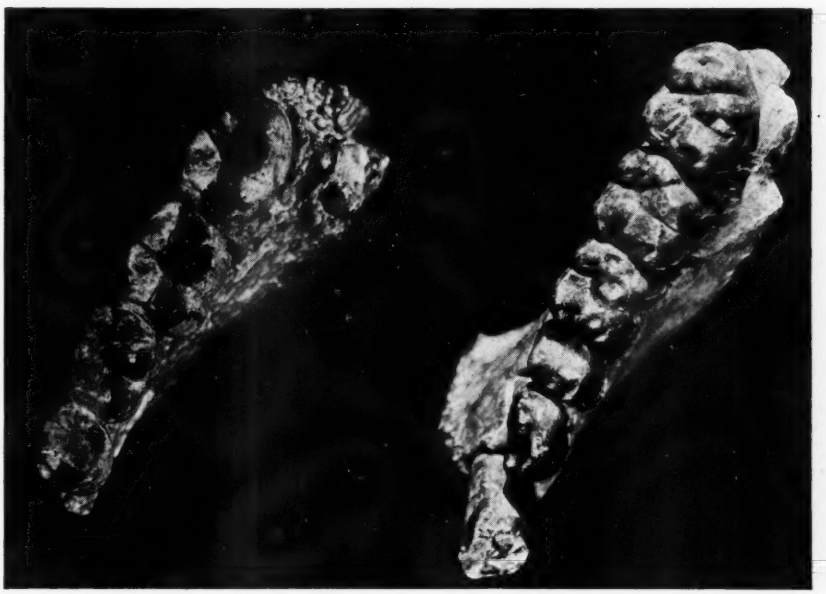

Fig. 9.—Typical left mandibular Anthropoid molars from which human teeth have developed. Both figures are from casts of jaws in the American Museum of Natural History of Dryopithecus, Miocene, India. Left figure Dryopithecus frickae, B1188. Right figure Dryopithecus cautleyi, B1187. Note all three molars are five-cusped, but M1 is smallest and M3 is secondarily enlarged: it is the largest of the molars.

the appearance of these teeth and from the secondary enlargement of the second and third molars compared with the Propliopithecus pattern I infer that these two examples of Dryopithecus are close ancestors of our modern Gorilla. For in the Gorilla once more we see the same clear-cut crystalline character of the cusps, and the secondary elongation of second and third molars. The first molar is now the smallest of the three. Of course the Gorilla has a long jaw and the root of the zygoma, or the key ridge as it is sometimes called, is set further back in relation to the molars than it is in the human jaws. I cannot help thinking that the long jaws of the Gorilla and elongation of the second and third molars are closely connected and may both be the result of some common influence which is at work in the moulding of the face of this animal. At any rate the dentition of the modern Gorilla forms a very strik-

ing contrast to that of the human being, and it enables us to emphasize by contrast what are the most important features of each.

I consider therefore that both human and anthropoid dentitions have developed from such a form as that represented in Propliopithecus. That means that the modern anthropoid pattern has developed through secondary enlargement of second and third molars with elongation of the jaws. I think that the human pattern has developed by emphasis of the first molar with maintenance of short jaws.

THE ANTIQUITY OF THE HUMAN DENTAL ARCH

Having examined what appear to be the steps by which the modern anthropoid dentition developed from that of Propliopithecus, we naturally want to know how the human type of dentition developed, probably from some original ancestor like Propliopithecus. Evolution has not brought so many changes for Man as for the Anthropoid because, as has already been shown, the characters of the dentition of Propliopithecus are really very similar in many important respects to those of Man today.

Now in this investigation it is useless for us to take such types as Pithecanthropus or Piltdown Man. I am not at all sure that the fragments which are gathered together under these names are really single individuals or even that they belong to creatures of the same kind. I think it is quite probable that both these so-called specimens of humanity are simply chance mixtures of odd relics of different primates. So we will leave them out of our discussion altogether. There are, however, three specimens, all of the old Stone Age, which are significant in the present discussion. These are respectively the mandible of a young lad discovered at Le Moustier, France, the mandible of an adult man found near Heidelberg and the skull of a curious type of man which was recovered from a mine in Rhodesia. The Le Moustier specimen is but one of a considerable number of similar relics which have been discovered of Paleolithic Man in Europe of that type which we know as Neandertal Man. The dentition is complete and it is interesting in that it shows the same crowding of lower incisors which is so frequent in Man today. It also shows retention of the left lower milk canine. The third molar, as one would expect, is the smallest of the three. The first and second are very nearly equal in size. Altogether the pattern of the dentition of this individual who lived some 35000 to 45000 years ago is for all practical purposes the same as the dentition of modern Man. In all this discussion we must remember that our generation and the generation before it are those which have suffered most heavily from the urbanization of mankind which took place after the so-called industrial revolution. So many features of dentition today, which are obviously the consequence of ill-kept mouth and teeth, result from deficient understanding regarding the importance of conservation of the first molar. I do not think they show the stigmata of devolution at all and I believe that the dentition of the generation which is now growing up in the schools will be in every way as good as that of primitive Man. The Broken Hill Man from Rhodesia has a skull differing very considerably from that of modern Man and much more closely resembling the skull of the European Neandertaler. Nev-

ertheless its dental arch is strikingly similar to the dental arch of modern Man. The features of the teeth are the same: the wear of the teeth is the same: the very type of caries is the same as that found in modern Man and it is quite instructive to note that the first molar is the largest of the series. Although we know nothing of the exact date of this Rhodesian example yet the characters of his skull proclaim a type of man who has been long extinct in Europe. One cannot but be struck with the preeminent size of the first molar and with this preeminence of the first molar there goes a general modern human pattern of dentition.

Of the Heidelberg Man who lived probably quite early in the Pleistocene period we know only the mandible. It is of unusual size as you are well aware but the teeth are quite modern in size and in character and there is little difference if any in the size of the first and second molars.

I will not weary you with fuller and further details of these various jaws. It is enough for our purpose to realize that at least since early Glacial times, in all probability, the type of dentition characteristic of modern Man has been an accomplished fact. We know of no stages between the typically human dentition and that of Propliopithecus and yet these two dentitions show such close likeness that there must be a relationship between them. It is also sufficiently striking that the features which are supposed to indicate a devolution of the teeth of Man today were also present in the very earliest examples of Man, namely the small size of the third molar, the small size of the canine tooth, the possibility of retention of a milk tooth, the crowding of the lower incisors, the large size of the first molar and its special liability to caries.

THE GENERAL PROGRAM IN DEVELOPMENT OF THE JAWS

The mandible is apparently a very simple bone. It consists of one element only or two if we should consider it in its younger stage before the union of the two halves at the symphysis of the chin. Its very simplicity, however, is misleading and probably there is no bone which is more complex in its development and its growth than the mandible. Indeed, it is a great deal easier to come to the study of this bone after we have thoroughly elucidated the development of the upper jaw for which the mandible forms an accessory. The sutural pattern of the upper jaw and its relation to the skull provide opportunities for study which are denied to us in the mandible. Having this principle in mind it was my duty to search for every scrap of evidence which could be got together regarding nature's experiments in the development and growth of the upper jaw.

It is a far cry from Man to deer but there is one feature which both have in common, namely that the last tooth to erupt is not forward in the jaw as in the hyaena but far back, namely the third permanent molar. The relative shortness of the human jaw lends some difficulties to its study in detail and it appears probable that the study of long-jawed animals like the deer and the baboon might yield results which can be read more easily than those to be obtained by an examination of the human jaw.

I therefore started to collect deer skulls and it was many years before fortune threw in my way three skulls which are important for this purpose.

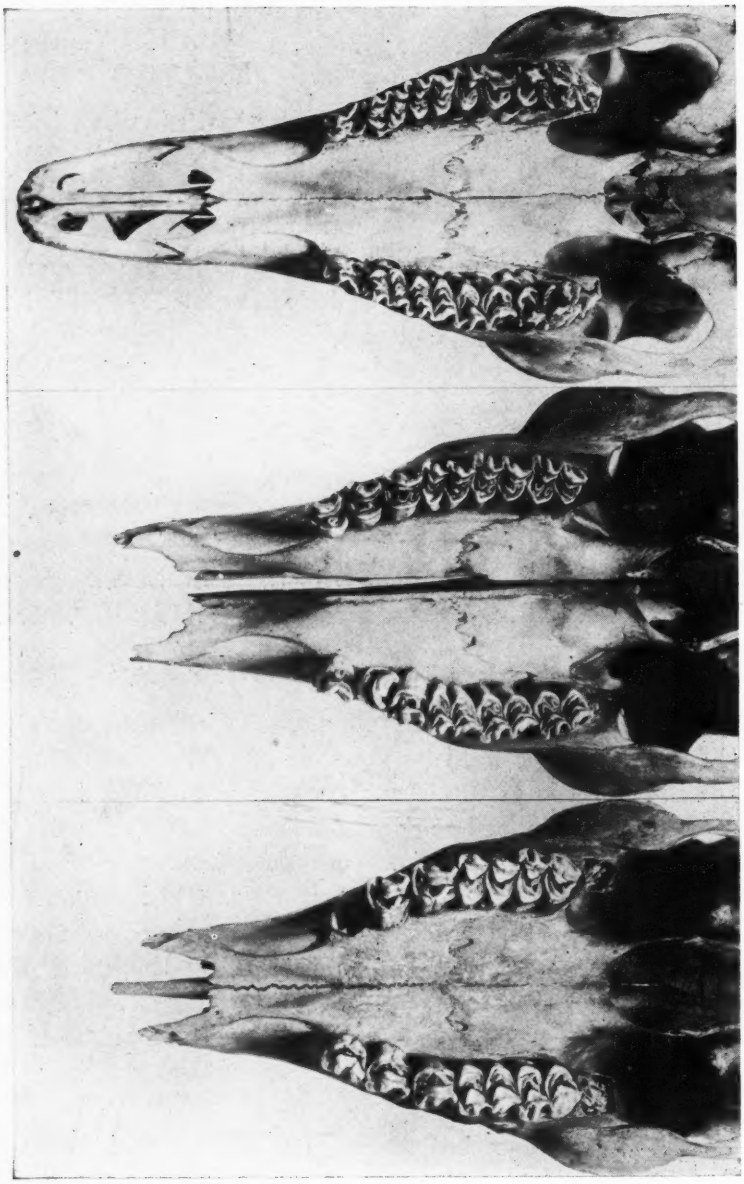

Fig. 10.—Development of palate and eruption of teeth in Virginia Deer Odocoileus virginianus. Left figure W.R.U. B805. Three milk molars in position, two permanent molars. Third permanent molar not erupted. Maxillo-palatal suture crosses palate between third and fourth teeth. Center figure W.R.U. B89, milk molars replaced by permanent premolars; all permanent molars erupted. Maxillo-palatal suture crosses palate between fourth and fifth teeth. Right figure W.R.U. B83, permanent premolars and molars erupted. Tuberosity of maxilla excavated to show total absence of third molar. The palate has not grown to full adult condition and maxillo-palatal suture crosses palate, as in left figure, between third and fourth teeth.

The first of these is the skull of a young animal which still has the three milk molars in position and has two permanent molars erupted. The suture which crosses the palate and forms the line of junction between the maxilla and the palate bone reaches the alveolar process between the milk molar series and the molar series or in other words between the third and fourth teeth. The next deer skull to which I want to draw your attention has the three milk molars replaced by permanent premolars and the three permanent molars are in position. The suture which crosses the hard palate now seems to have moved further back because it crosses the hard palate at the level between the first and second permanent molar teeth. Now it is not true that this suture has travelled back. On the other hand the whole cheek teeth series with the alveolar process of the maxilla have travelled forward. The palate bones, in this movement, act as a relatively stable stanchion around which the maxillary movement could progress.

Now if one is justified in assuming that the change in the general anatomy of the palate is related to eruption of the third permanent molar it follows that if we could find a skull which has reached the same adult condition as the second of the two presented and yet in which the third molar has not erupted and is not present as an impacted tooth in the alveolus we ought to find the hard palate retaining the general characters of the younger of two skulls just presented. The suture between the palatal process of the maxilla and the palatal process of the palate bone should cross the hard palate at the level of the interval between the last premolar and the first molar. I had to wait a long time before I found such a skull but eventually I did get the deer for which I had hoped. In this skull the suture between maxilla and palate bone actually crosses the palate in the interval between the last premolar and the first molar. Here then is very definite evidence of the relations of palatal growth to the eruption of the teeth. In our study of the development of Man's palate therefore the deer skull is of much greater significance than that of the hyaena for the reason which I have already stated, namely that the last tooth of the dental arch to erupt is not far forward in the maxilla as in hyaena but far back at the extremity of the dental arch.

With this encouragement from study of the deer we progress to another study in development of the upper jaw, undertaken by Miss Perrine. For her purpose Miss Perrine took the skulls of five male Bleeding-heart Baboons (Theropithecus) from Abyssinia. All these animals were wild killed and represent five distinct stages in the development of the dentition from the eruption of the first permanent molar to the eruption of the third. I am not going to set forth the details of this investigation, the results of which will be published in due course by Miss Perrine herself. But I do want you to observe that between the first and the last stages of development of teeth of this animal there is considerable growth of the palate. A small amount of that antero-posterior growth is found in the premaxillary element. None is to be found in the palatal bone itself but by far the largest part is noticeable in the palatal process of the maxilla. Coincidentally with the growth forward of the maxilla with its alveolar process and contained teeth, which is related to the eruption of the permanent molars, one observes that the key ridge, or if you like,

the middle root of the zygoma, gradually changes its position relative to the teeth. In the first stage it lies opposite the crenation between the mesial and distal buccal cusps of the first molar. In the last stage it lies opposite the interval between the second and third molar teeth. Now this is not due to a backward migration of the zygoma: it results rather from a travelling forward of the alveolar and palatal processes of the maxilla.

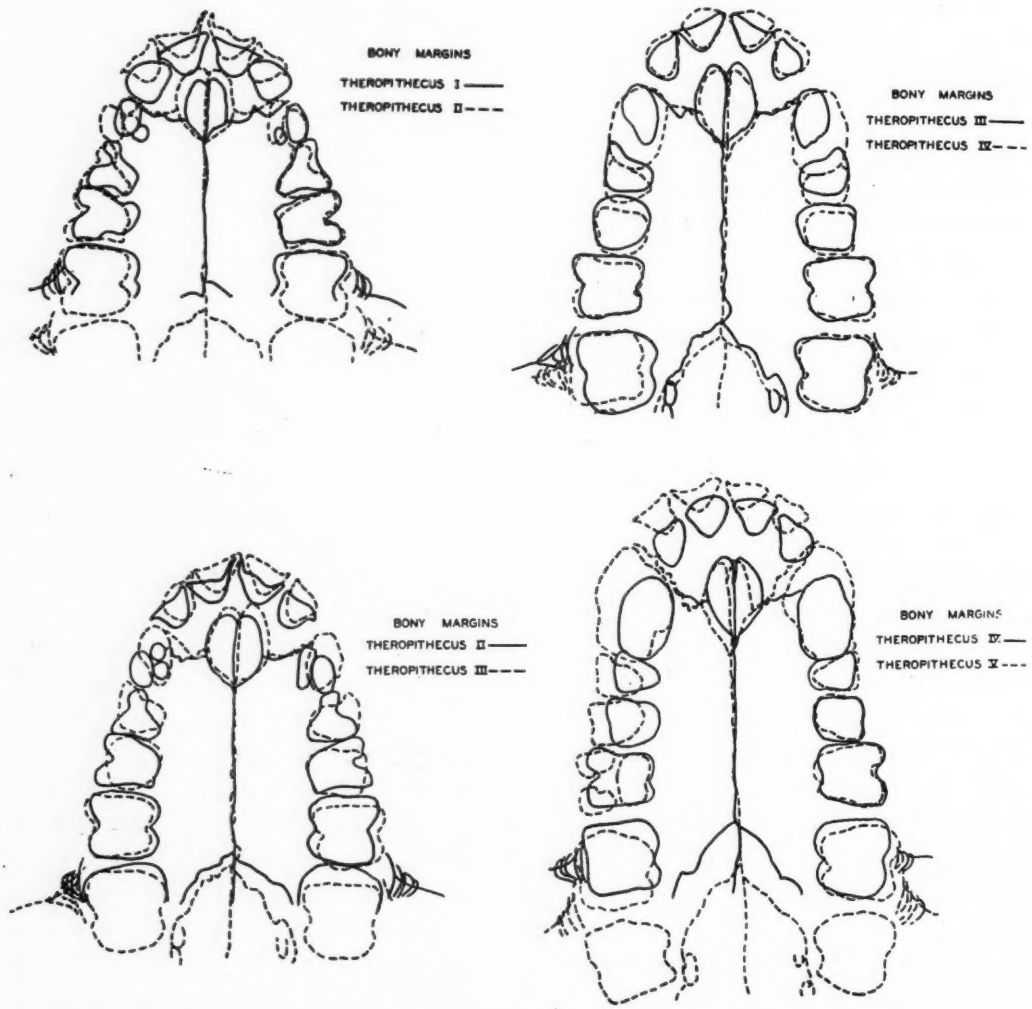

Fig. 11.—Superpositions of palates and bony margins of tooth sockets in five Bleeding-heart Baboons, Theropithecus obscurus, by Ruth Perrine. These figures show the localized development of palate occurring at different stages of growth.

The greatest change in growth of the jaw in this series of baboons is to be found between the first and second stages and between fourth and fifth, that is to say, about the time of eruption of the first molar and about the time of eruption of the last molar. I cannot leave this fact without pointing out its significance. When we apply these results to the human dentition, as Doctor Howard has stated so clearly, there must be spurts in growth of the human jaw. We must know just when these spurts occur and when the jaws are in a state of moderate quiescence. There is certainly a spurt of growth

about the time of eruption of first molar and another at the eruption of the third exactly as we find in the dentition of this baboon. The point is however that because of its long jaw we are able to identify the details of change better in the baboon than we can in a short-jawed creature like Man.

THE LOCAL EVIDENCE OF BONE GROWTH

We have now traced the sites where we must look for evidence of increase of dimensions through bone activity in the development of the upper jaw from the child to the adult. We have noted that there will be a certain amount of bone growth somewhere near the anterior palatine foramen in the premaxillary element. We may also look for growth in the alveolar palatal process in the superior maxilla. But we must not look for antero-posterior growth in the palatal process of the palate bone. It is true that the palate bone does undergo growth but this occurs in the vertical direction and that is another story with which we have nothing to do today.

No matter what the cause of bone growth, provided activity of the bone is taking place, the same signs must be obvious. A bone cannot grow without increased nutrition and this cannot occur without increase of vascularity. The same results are apparent in healing after fracture or amputation of a bone in which the new tissue deposited is called callus. The extremely porous character of this callus is evidence of the intense vascularity of the area. The macerated bone shows no vessels but simply the places from which the vessels have been macerated out. Now active bone also shows great vascularity and wherever we see bone which is highly porous we may know that in these pores have been blood vessels. Bone activity is not necessarily pathologic: it may be due to an entirely normal and ordinary cause. If the bone is not very vascular it is neither growing nor being remodelled.

In order to elucidate these phenomena it was necessary to set to work with another team of colleagues upon the processes of repair and growth of bone and from these studies we have learned the simple facts that I have just laid before you. Vascularity means bone activity. A relatively avascular condition is evidence of quiescent bone. If we see a bone surface which is not vascular at all but looks as though some gutterings from a bony candle had been spilt over it we know that that bone is quite settled in its condition.

So my next problem was to hunt up material among the monkeys and apes which would show us the differences in vascularity of jaws. We should then be able to note whether the vascularity is to be observed at the times we know bone growth to be taking place in connection with the eruption of teeth, and if it is present in the areas that we have now learned are those in which actual change of bone substance is taking place.

As examples of these I have chosen two skulls of Chimpanzees, one of a young animal with a complete milk dentition, the other of a recently adult animal in which the third molar is scarcely completely erupted. By comparison of the jaws of these two animals we note to our surprise and delight that the porosity or vascularity of bone is to be found in the young animal precisely in those sites where we have predicted that it would be found, namely in the palatal process of the maxilla and to a less extent in the palatal process

of the premaxilla; not at all in the palatal process of the palate bone. We see this vascularity also along the alveolar process where the teeth are actively changing, at least where the substance of the bone is undergoing change preliminary to the loss of the milk teeth, and where the permanent teeth are already growing in their crypts preparatory to their eruption. When we look at the adult specimen we find that the vascularity is now confined to the alveolar process around the erupting third molar and to the alveolar process around the incisors. As in Man the incisors of the Anthropoid Ape are set in quite loosely so that they will not easily snap off under strain.

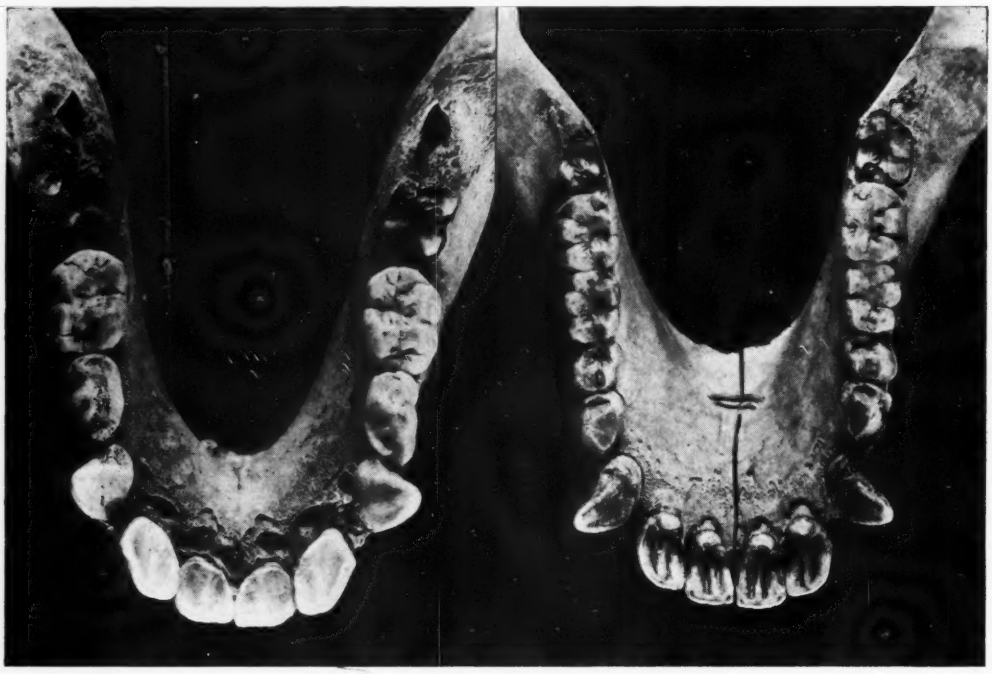

Fig. 12.—Comparison of jaws of Chimpanzee, Pan sp. to show vascularity of bone undergoing changes in form around roots of teeth. Left figure W.R.U. B410, young animal, milk dentition. M1 in crypt with alveolar perforations for rudiments of M2, and for permanent incisors, canines and premolars. Right figure W.R.U. B240, young adult animal before eruption of M3. Note sole remaining vascularity shown around roots of incisors, canines and erupting M3.

THE TRANSFERENCE OF RESULTS JUST PRESENTED TO THE STUDY OF HUMAN DENTITION

One may ask why carry out all these observations on other animals when it is Man whom we wish to study. I have tried to show you how in logical sequence we have put together observations which have been carried out partly on Man and partly on other mammals for the elucidation of problems of growth of the jaws. I have also shown you how it is necessary to use animals for our purpose in which we have reason to believe there will be a particularly clear demonstration of the phenomena. For example it would be absurd to study maxillary growth on a short-jawed animal first when long-jawed animals are at hand because the distinction between various stages in the long-jawed mammal will obviously be clearer than those found in the short-jawed animal. Running through all our work, however, you will have

observed that our energies directed toward the one goal, namely the elucidation of development in the jaws of Man and at the end of my presentation we come back once more to the human maxilla. We observe a shifting forward of the entire alveolar process with the upper teeth during the growth of Man from childhood to adult condition. Can we find different relations between the key ridge and the upper dental arch while this change takes place? If this is possible it is apparent from what has gone before that we know also where in detail to look for the growth which has occurred. We shall find it particularly in the superior maxilla, certainly not in the palate bone. The palate bone as in lower animals will act as a stanchion around which the superior maxillae with their alveolar processes and contained teeth move forward. You will see that we are not considering at all, for the moment, vertical growth of the face and jaw. That, as I have already said, is a story for another occasion and is more bound up with the history of the palate bone than it is with the history of the maxilla.

The elucidation of growth of the jaws in Man in our laboratory has fallen largely to Doctor Holly Broadbent and Doctor Broadbent has generously handed over to me a number of slides illustrating the very features that we want to observe corresponding to the changes of development of the Bleeding-heart Baboon which I showed you a little while ago. Now Doctor Broadbent is about to publish this work, and while I am deeply appreciative of that spirit of scientific generosity which has prompted him to permit me to bring the slides here to show to the Southern Society of Orthodontists I am sure you will agree with me that we should leave this presentation in published form to Doctor Broadbent himself.

CONCLUSION

In summarizing the foregoing remarks I should like to draw to your attention the fact that we have covered in lantern slides the following problems: First, how defects of the human dentition, jaws and face and cranium suggested the general plan of the work. Second, how growth of the face comprises increase in dimension, unequal in extent and nonsynchronous in time and how this means endless adjustment in the skeleton of face and cranium. Third, how the human jaws are probably not undergoing devolution today as has been suggested and how their plan of formation centers on the first molar teeth in contradistinction to the plan of dental arch formation of the modern Anthropoid. Fourth, how the striking differences between Man's dental plan and that of the Anthropoids led us to examine the growth of the palate in the long-jawed animal. Fifth, how we come to realize the stanchion action of the palate bone in movement forward of the maxilla and how we came to understand various relationships of the key ridge and of the orbital point to the dentition. Sixth, how the phenomena of bone repair after fracture or amputation enabled us to interpret the appearances accompanying that activity in bone growth in the upper jaw. Last, how plastic is the entire form of the jaw and how readily influenced it is by defect of dentition.

LEGAL PROTECTION OF EDUCATIONAL STANDARDS*

By Guy S. Millberry, D.D.S., San Francisco, Calif.

SINCE this discussion involves two distinct things, (a) educational procedure and (b) its protection by law, it seems appropriate to divide it into two parts, discussing them separately, then correlating them in the summary.

When the aims of education are to secure the right kind of a product and when through intelligent, consistent and persistent application the means adopted will secure this result, then only is education good. For this purpose educational standards are desirable and their legal protection is necessary. The insemination of this idea is the purpose of this paper.

HISTORICAL

As we review the history of formal education, we learn that there was little or no progress prior to Greek civilization. Since then every step has shown that some standard in education must prevail.

Nearly all forms of education in all nations from the earliest times were intended to prepare men to serve the state. In modern times this idea is illustrated by the fact that every state in the union provided for education in the drafting of its constitution. Out of these instruments there came laws for the protection of the schools. The public school law today is one of the most impregnable sections of our substantive law.

A brief discussion of earlier educational procedure may be admissible, since present standards are the result of it.

The educational methods of Socrates are well known, namely to prove the truth or by clever questioning to force the person questioned to develop his thought so that he had to acknowledge that his views were imperfectly formed, and thus were opinions only, or admit that he was uninformed.

Plato, his pupil, believed that the governing body of the state should be the philosophers, who were the only members of the community to receive a higher education. Plato's *Republic* has formed the groundwork for many theses on government and education since that time.

Aristotle, a pupil of Plato, advocated certain educational standards which have found their way into our statutes today. He believed that the training of the body should start before birth by having a legislator consider who was fit to marry and at what age; that the training of the body is preparation for formal schooling, which latter should be divided so that the impulsive or irrational side of the soul would be trained before puberty and the rational side afterward.

New ideas in educational procedure are usually discountenanced and these were no exception to the general rule; nevertheless, the educational systems

*Read at the Twenty-eighth Annual Meeting of the American Society of Orthodontists, Estes Park, Colorado, July 16-19, 1929.

originating with the Greek philosophers became under the guidance of the Romans with their concept of law the great system of principles that underlies and guides our present civilization.

From Athens, where the first university existed, to Rhodes, Pergamon, Alexandria, Rome, Paris, Oxford, Cambridge, Harvard, is but a series of steps in the great educational movement, and a list of the biographies of the great educators, Erasmus, Comenius, Ignatius Loyola, Rousseau, Pestalozzi, Herbert Spencer, not to mention the Americans from John Harvard to John Dewey, is but a bibliography of the literature on educational standards and educational law.

EDUCATIONAL PROCEDURE

Successful educative effort is based on true educational philosophy, supported by sound pedagogic procedure. It is necessary that the community as a whole have a true concept of the value of these if such effort is to be carried on.

In some localities and in some institutions educative effort becomes frozen. It shows relatively small progressive changes, if any. There is no movement forward in conformity with the advancement of knowledge.

In others the unrest in social life is so marked that education is unable to keep pace with the rapidly changing standards and is apt to lose touch with the culture of the community and thus fails to serve its purpose.

Education is a dynamic not a static force, and it is important that its effort be guided so that it will best serve the state. There is a difference between that knowledge which is mere static information, or dead ballast, and that which is the medium for dynamic thought or power.

In discussing this subject, I wish to use orthodontic education as an illustration because we are all interested in it.

The proposal to change the educational procedure in orthodontics is not new. It is but an attempt to reestablish or, where necessary, reenforce courses of instruction in this science, or those related to it, which have in some instances dwindled to mere suggestions of instruction in the most important specialty in dentistry.

I make this statement reservedly and yet with some knowledge of the facts. Selecting fifteen dental schools in America and reviewing the announced courses of instruction in orthodontics, I find the number of hours devoted to this subject in the five or six year curriculum ranges from 40 to 288. This represents from 0.5 per cent to 4 per cent of the total hours in the curriculum, using 1400 hours of instruction as a yearly basis.

Educational procedure should consider preparatory instruction. Because this is related, I beg to submit for comparison the two-year predental and the three-year premedical curricula offered in the University of California. The reason for doing so will be evident in discussing the subsequent charts.

In Chart I you will note that all students entering the University of California are required to pass an examination in English and to complete a certain number of units in military science and physical education. The military science requirement is applicable to all land grant colleges in the United States. In addition to the examination in English expression, at least six

Chart I

Predental Curriculum

First Year

	Units First Half	Units Second Half	Total Units
Subject A (examination in English expression)	--	--	
Military Science 1A-1B	1½	1½	
Physical Education	½	½	
General Inorganic Chemistry and Qualitative Analysis, with Laboratory (Chemistry 1A-1B)	5	5	
English 1A	--	3	
General Zoology (1A-1B) or	4	4	
Physics 2A-2B	3	3	
Foreign Language	5	3	
Electives	0 or 1	0	
	16	16 or 17	32 or 33

Second Year

	Units First Half	Units Second Half	Total Units
Military Science 2A-2B	1½	1½	
Physical Education	½	½	
Elements of Organic Chemistry (8)	--	3	
Elements of Organic Chemistry (Laboratory) (9)	--	3	
Social Sciences, Philosophy	3	3	
Enblish 1B	3	--	
Foreign Language	3	--	
Additional year course	3	3	
Embryology 100	2	--	
Electives as necessary to make up units	0	2	
	16	16	32

Premedical Program

For students who have completed *two* years of foreign language in high school.

First Year

	Units 1st Sem.	Units 2d Sem.
Subject A (Examination in English Expression or Course in Subject A in case of failure in the examination)	--	--
Military Science	1½	1½
Physical Education	½	½
Chemistry 1A-1B	5	5
English 1A-1B	3	3
Foreign Language	5	3 or 5
Electives as necessary to make up units	--	--
	16	16

Second Year

	Units 1st Sem.	Units 2d Sem.
Military Science	1½	1½
Physical Education	½	½
Zoology 1A-1B	4	4
Year Course (E)	3	3
Year Course (E)	3	3
Electives (Foreign language if necessary to complete 15 units for junior certificate)	4	4
	16	16

Third Year

	Units 1st Sem.	Units 2d Sem.
American Institutions 101	2	--
Physics 2A-2B	3	3
Physics 3A-3B	1	1
Chemistry 8	--	3
Chemistry 9	--	3
Zoology 100	3	--
Electives	6	6
	15	16

units of English are required in both the predental and the premedical curricula. General inorganic chemistry and qualitative analysis and organic chemistry are required in both courses. In the predental curriculum general zoology or physics may be taken during the two-year period, while in the premedical curriculum both are required. The foreign language requirement is approximately the same in these curricula, and the additional subjects grouped as electives or year courses are practically uniform. These courses must be selected from a list of subjects prescribed for the Junior Certificate.

Because of the similarity in these curricula, it is not at all difficult for a student to transfer from the predental to the premedical curriculum or vice versa during the period of residence in the university, while under the jurisdiction of the College of Letters and Science. The reason for presenting

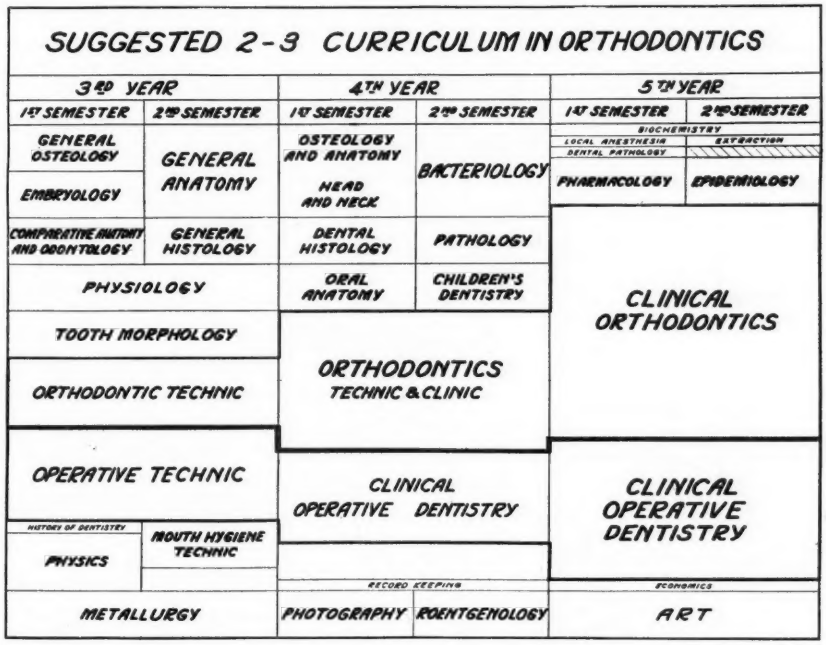

Fig. 1.

these curricula is to show the possibility of erecting a superstructure of orthodontic education within a three year period following the two-year predental or the premedical curriculum.

In Fig. 1 I submit a suggested curriculum covering a period of three academic years, which includes practically all of the instruction given in the first three years of the four-year professional curriculum and several courses from the fourth year, omitting entirely all instruction in crown and bridge and plate denture prosthesis. In some subjects the instruction given in this three-year professional curriculum exceeds that offered in the four-year professional curriculum, as now given. Such a proposal, however, would probably be considered revolutionary and, therefore, would not meet with general approval.

I believe, however, that it would be better to adopt a transition program which would accomplish the desired result without disturbing the educational procedure in our colleges of dentistry to any marked degree. Fig. 2 illus-

trates this idea. Here I have portrayed the one—four year curriculum as at present offered in the University of California. In the predental year I have indicated only the subjects of major importance, zoology, English and inorganic chemistry; military science and physical education are required at the University of California but not elsewhere in the state, and the other subjects to fulfill the 28 unit minimum requirement for admission to the professional course may be chosen from a selected list.

The professional curriculum is graphed to show distinctly the mass of instruction given in dental technology and further to show how, as the student advances toward the completion of his course of study, all of the general science subjects are squeezed out.

This chart in this form indicates the possibility of maintaining the same courses of instruction in general science and applied science and all of the

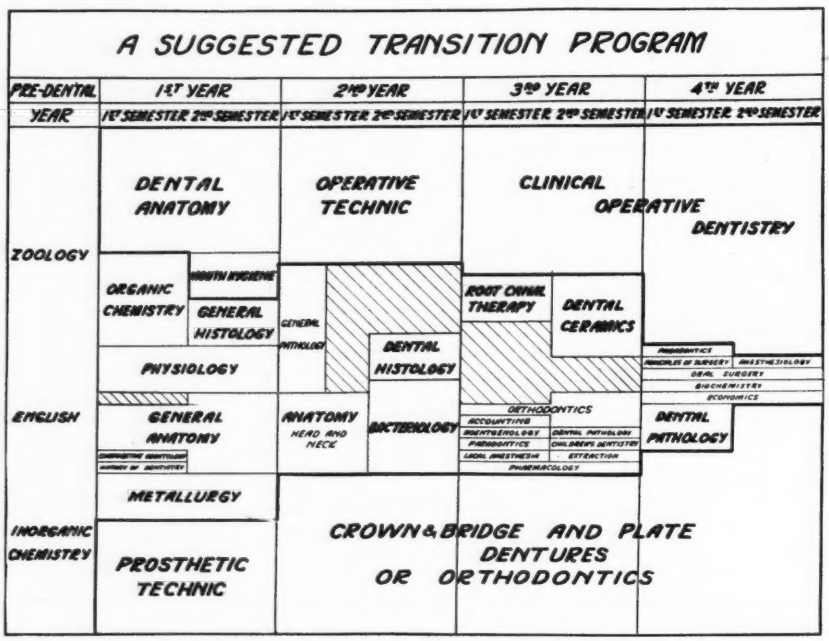

Fig. 2.

courses in operative dentistry with the opportunity of substituting orthodontics for crown and bridge and plate denture prosthesis. My convictions are that neither of these latter subjects is essential to the training of an orthodontist but that all of the other subjects in the dental curriculum are. I believe that the problem of replacement in dental service is as far removed from orthodontic service as anything can possibly be in the treatment of lesions or conditions of the oral cavity. If any part of the science of prosthesis is necessary in orthodontic education, there is enough free time available in this curriculum to provide for its introduction.

Students who contemplate the study of orthodontics can under this plan elect this course; others may choose the course in general dentistry. The only difference between the status of these two groups of students will be that one group pursues orthodontic study, technically and clinically, while the other

group pursues the study of crown and bridge and plate denture prosthesis, during practically the same number of hours.

On completion of the course, the degree of Doctor of Dental Surgery can be offered, and the students will present themselves for examination before the State Board of Dental Examiners, indicating at that time whether they desire a license as an orthodontist or as a dentist. Their credentials will determine their status. It is apparent that some changes in the dental law will have to be made in order to meet this problem. In so far as the board examinations are concerned, the difficulties are not insurmountable. In fact, the problem is very simple, for a student is now required to pass an examination in the theory of orthodontics, and under changed conditions in the law he would be required to perform certain practical operations, technical or otherwise, in this field, instead of in prosthetic dentistry.

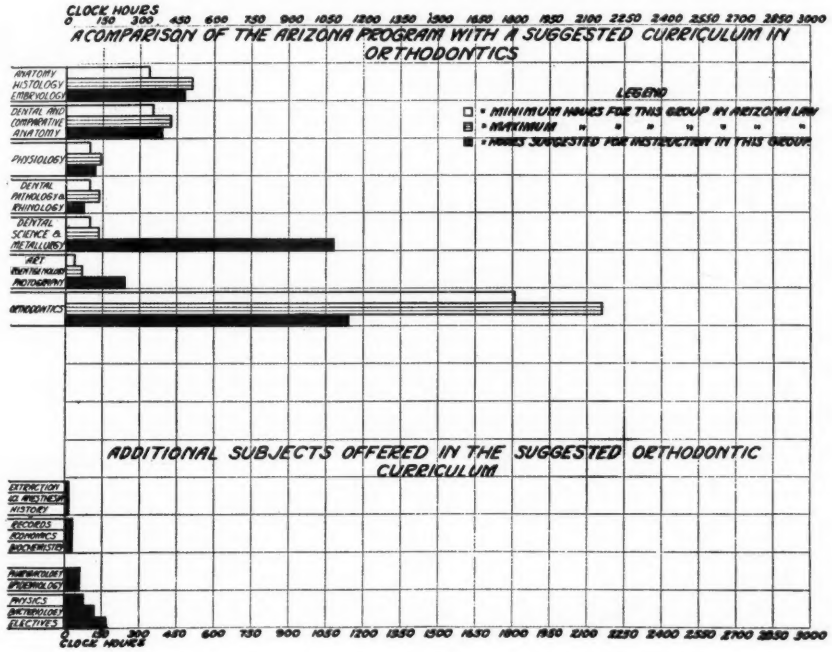

Fig. 3.

During the past few years the requirement in prosthetic dentistry in California has been the preparation of a natural tooth for a porcelain veneer crown including the swedging of the platinum matrix and the preparation of a cavity for a gold inlay and the casting of said inlay. The student who chooses to qualify as a licentiate in general dentistry would take the regular examinations as now offered, subject to the usual changes by the Board of Examiners.

Fig. 3 shows a comparison of the Arizona program with the suggested curriculum in orthodontics. The subjects are grouped as per the Arizona law and are graphically presented as follows: The clear sections represent the minimum number of hours for the group in the Arizona law, using 3400 hours of professional instruction as the basis; the horizontally hatched sections represent the maximum number of hours for the group, and the solid sections represent the hours in the suggested curriculum as presented in Fig. 2.

A study of this comparison shows no wide divergence of educational procedure, except in the difference in the subjects upon which the emphasis has been laid. In the Arizona law the study of orthodontics receives the preponderance of the time, nearly twice as much as is given to this course in the suggested plan; the subjects of dental science and metallurgy receive a very small allotment of time in the Arizona law, and in the suggested plan they have been given approximately the same amount of time as has been devoted to orthodontics. In addition, the suggested curriculum offers instruction in a number of subjects which have not been mentioned in the Arizona program and which, in my opinion, should be included in any orthodontic curriculum.

TABLE I

SUBJECTS	ORTHODONTIC CURRICULUM ARIZONA LAW				*A SUGGESTED CURRICULUM (3 YEARS)	†PRESENT CURRICULUM (4 YEARS) UNIVERSITY OF CALIFORNIA
	MINIMUM TIME		MAXIMUM TIME			
	PER CENT	HOURS	PER CENT	HOURS	HOURS	HOURS
Anatomy Histology Embryology	10	340	15	510	480	390
Dental anatomy Comparative anatomy	6	204	8	272	240	345
Physiology	3	102	4	136	120	120
Dental pathology Rhinology	3	102	4	136	75	163
Dental science Metallurgy	3	102	4	136	1080	1725
Art Roentgenology Photography	1	34	2	68	240	15
Orthodontics	53	1802	63	2142	1140	60
Total	79	2686	100	3400	3375	2818
Physics					75	0
Organic chemistry					0	120
Dental history					15	15
Bacteriology					120	120
Record keeping and accounting					30	15
Local anesthesia					15	15
Extracting					15	15
Pharmacology					60	30
Biochemistry					30	30
Economics					30	30
Principles of surgery					0	15
Anesthesiology					0	15
Oral surgery					0	30
Epidemiology					60	0
Electives					135	332
Total					585	782
Plate dentures and crown and bridge					0	1680
Total	79	2686	100	3400	‡3960	‡5280

*Presupposes a two year predental course.

†Presupposes a one year predental course.

‡A 44 hour week, 30 weeks to the year, not including 2 weeks for final examinations.

Table I is a comparison of the orthodontic curriculum outlined in the Arizona law, showing the minimum and the maximum time given to each group of subjects, with the suggested program. It also shows the time devoted in the suggested curriculum to other subjects not included in the Arizona program and the time allotment for the present four-year curriculum at the University of California. This table is offered for comparative study only.

TABLE II

SUBJECTS	COLUMN 2			COLUMN 3		
	SUBJECTS	HOURS	TOTAL	SUBJECTS	HOURS	TOTAL
Group 1						
Anatomy	General anatomy	180		General anatomy	165	
Histology	Head and neck anatomy	120		Head and neck anatomy	105	
Embryology	General histology	60		General histology	60	
	Dental histology	60		Dental histology	60	
	Embryology	60	480			390
Group 2						
Dental anatomy	Comparative odontology	60		Dental anatomy	330	
Comparative anatomy	Tooth morphology	120		Comparative odontology	15	
	Oral anatomy	60	240			345
Group 3						
Physiology	Physiology	120	120	Physiology	120	120
Group 4						
Dental pathology	General pathology	60		General pathology	88	
Rhinology	Dental pathology	15		Dental pathology	15	
			75	Histopathology	60	163
Group 5						
Dental science	Operative dentistry	840		Operative dentistry	1215	
Metallurgy	Mouth hygiene	60		Mouth hygiene	180	
	Children's dentistry	60		Children's dentistry	15	
	Metallurgy	120		Paradontics	30	
				Root canal therapy	60	
				Dental ceramics	105	
			1080	Metallurgy	120	1725
Group 6						
Art	Art	120		Radiography	15	
Roentgenology	Roentgenology	60				
Photography	Photography	60	240			15
Group 7						
Orthodontics	Orthodontics	1140	1140	Orthodontics	60	60
Total			3375			2818

Table II presents the detail of the subjects included in the various groups as specified in the Arizona law and indicated in columns 2 and 3 of Table I. The purpose of this is a detailed explanation of the first table.

Curricular changes such as these are in my opinion inevitable. The growth trend in both undergraduate and graduate instruction in the leading universities in America indicates this.

Readjustment through small or even imperceptible degrees is the ideal way to bring about any educational reform. If this method is followed, the educational domain will not be subjected to sudden or violent revolutions in policy which are so destructive of educative effort.

LEGAL DEFENSE

Having reviewed the educational phase of my subject, I shall now discuss the legal defense or protection of educational standards.

Every Greek city had its special character, and to this character the education given in it must conform if it was to be an effective instrument for training its citizens. For instance, in the Spartan system strength, courage and obedience to the laws were held to be the aim of education.

From these fundamental conceptions flowed the demands of Plato and Aristotle that education, in all of its details, should be regulated by state authority, should be compulsory, and should be uniform at least in its earlier stages for all.

In 1642, six years after the founding of Harvard University, Massachusetts passed an act which gave the selectmen in every town power to oversee the education and employment of children.

The Massachusetts public school system, founded in 1647, considered as the progenitor of practically all systems in the United States, presents certain fundamental principles, as follows:

> "1. The universal education of youth is essential to the well-being of the state.
> 2. The obligation to furnish this education rests primarily on the parent.
> 3. The state has the right to enforce this obligation.
> 4. *The state may fix a standard which shall determine the kind of education and the minimum amount.*"

The customs of society are being modified by law; no better illustration need be given than the Volstead Act. However, in this country, control of human relations or human destinies by law was never intended.

Some persons believe that all forms of licensure should be abolished and that every man should be permitted to engage in any vocation he chooses, the public to be the judge of his qualifications; yet the possibility of the transmission of disease and of injury to human kind is a good enough reason for inhibiting this freedom by law in so far as matters of health are concerned.

The cardinal doctrine of state interference in the educational domain is universally accepted by all the great nations of the world, and most of them are agreed as to its extent and limits. This interference does not extend so far into the vocational field as it does into the professional field; though some legal defense of the standards of both fields is advisable.

Substantive law by which rights are created is that branch with which we are concerned today. The rights of little children to be protected against the incompetence of those who desire to practice orthodontics and are not qualified to do so; the rights of parents to know whether the orthodontist has submitted to normal tests as to his knowledge and ability and thus, in a measure, proved his worth; the rights of the orthodontist to adequate protection after he has prepared himself for such practice, are all phases of substantive law.

There are many precedents to justify the legal protection of standards in orthodontic education, and none are more potent than the dental law itself. Dental laws were drafted first to protect the people against the incompetence of dentists. Up to the time of their enactment, a graduate of a college was admitted to practice on the presentation of his diploma and the payment of a small fee to the secretary of the Board of Dental Examiners.

Some dental colleges violated the confidence placed in them to such a degree that it became necessary to amend the laws to protect the public against the graduates of dental colleges. A condition similar to this exists in many of our schools today, our own included, in so far as undergraduate instruction in orthodontics is concerned.

Some laws become obsolete because social experience demonstrates their worthlessness; others require amendment to meet the conditions produced by constant shifting in social life. The types of social and economic order of a century ago were such that the substantive law of that period would not be tolerated today and even within the last decade demands for new legislation have had to be met. Witness the laws re aviation and the radio.

A century ago, the head of the household in the rural villages had to build his house, provide water, fuel, light from candles, food, clothing, shoes, all under the roof of his own domicile or on the land surrounding it. The local grist mill, tannery and carriage factory were county conveniences. Today, flour is milled in Minneapolis and shipped to the farthest parts of the world and parts of vehicles are made in many industrial centers, assembled in others and distributed by sales agents to you at your door. This is characteristic of practically all of the necessities and comforts of existence.

E. W. Lord writes: "The industrial and social development of the race has largely come since the general adoption of the principle of a division of labor—specialization. There was always a time when there was some division of labor due to ability or desire, but only in recent years has the principle been recognized as the foundation stone of efficiency."

SUMMARY

Changes in dental education during the past decade have been rapid and are still taking place. It has been said that these changes, together with the proposed changes in orthodontic legislation, are splitting up dentistry. Dentistry has been splitting up into specialties such as yours and a number of pseudospecialties for forty years, and you, yourselves, by taking up this specialty are chiefly responsible for it. What we need now is not a coalescing of the practice into a homogeneous thing as it was in 1840 but a clear understanding of the trend in dental practice, with provision for preparing for it and a legal definition of its various phases and the limitations of each, in the interest of public welfare.

Newly promulgated precepts or doctrines should be studied with the idea of learning whether they will benefit society or not. They should not be condemned because they are new, nor conveniently and complacently submerged through *vis inertiae* by those whose duty it is to protect the public and advance their own profession.

The cost of dental education is advancing rapidly. In our universities, professional education is one of the greatest financial and administrative problems of the present day. Such institutions are concerned only with the right kind of a product.

They are unwilling to inaugurate and develop special schools and curricula to conform to the whims and caprices of individuals or groups who believe that every vocation or profession must be developed as an independent unit; but they

are willing to bring about a consolidation of instructional activity in related subjects or departments, thereby improving the instruction and incidentally reducing the costs of operation. They strongly approve of sound instruction in fundamentals, with such ancillary courses as may be necessary to produce a good product in any profession.

Human conduct falls within three domains, says Lord Moulton: 1. Positive law (statutes and decisions). 2. Obedience to the unenforceable (moral and social restraint). 3. Free choice. While the majority of the dental profession, whether influenced or not by the Code of Ethics, comply with both the first and second of these classifications, there is a sufficiently large number who transgress both the moral and social obligations as well as the statutes; hence it is advisable to enact legislation to protect the public from their practices.

The greatest step in the development of substantive law in health protection in the last century has been made in the field of sanitation. The next great step will be in the field of personal hygiene and prevention as a part of the child welfare program now being so widely disseminated. Orthodontists must play their part. They have an important primary service and duty to perform which is not secondary or subsidiary to dentistry as a whole.

The time is not far distant when the children of our country will flow directly into the offices of the orthodontist and the children's dentist, where hygienic service will also be rendered, and from there they will be referred to the family dentist for such service as ignorance carelessness or misfortune may make necessary. It is the logical thing to do.

The general dentist and the orthodontist, too, must look well to the encroachment in their diagnostic fields as well as their designing and creative activities by the dental laboratories or both, as well as the public, will suffer by a lowering of the standards of professional service.

Josh Billing's statement, "It's a fine thing to know a lot of things, especially if some of them are so" is a truism. It is also a fine thing for a dentist to know a lot of things about dentistry, especially if some of them are so, but I challenge the individual who declares or believes that he comprehends and can practice all that is known about dentistry today.

It is for this reason, I believe, that education in orthodontics should be extended and amplified without being fettered by certain elements of dental practice, especially replacement service, so that the student in orthodontics can obtain the training he needs and thus be better qualified than he now is to render such service.

And further, I believe it is absolutely futile to enlarge and amplify courses of instruction in orthodontics unless some legal defense of the altered educational and professional standards is established by amending our dental laws.

The foremost duty of the profession is to supply a dependable, unselfish service to others. The foremost duty of the schools is to provide the educational facilities that will create a group which will render this service. The foremost duty of the state is to protect the people, especially the children from the acts of incompetent or unscrupulous practitioners in the healing arts.

No other motive than the desire to promote these ends has prompted the effort thus far put forth. Any ideals less worthy will not justify a continuation of our interest.

DISCUSSION

Dr. Marcus L. Ward, Ann Arbor, Mich.—Inasmuch as I left home to come here by automobile several days ago, I did not receive a copy of the essayist's paper until I reached Estes Park. Since its receipt, however, I have read it two or three times and have made some notations from which I shall be obliged to discuss the paper extemporaneously.

After I read the paper, I made notations of the different topics that the essayist had presented. The first notation relates to control of education by law; the second to the importance of orthodontics as a specialty in dentistry; the third to the Arizona law; the fourth to an improved Arizona law presented by the essayist to extend orthodontic education.

The illustrations which the essayist has used in reference to the control of the different branches of education by law would seem, in view of our own experiences in the dental profession, to be adequate justification for the control of dentistry by law. Whether or not the proposal to protect the specialities, as the essayist suggests, is another matter which we may be obliged to consider, should other states than Arizona attempt to create a specialist out of a person who is not also a dentist. For many decades it has been recognized as necessary to protect medicine, dentistry, and in some places, education, from the incompetence of those who might attempt to follow these professions. Such protection as has been offered has been in the nature of a general one intended to safeguard the interests of the public and to allow these professions to develop. The attempt to protect the specialists in these professions by law is a new aspect of legal protection which may or may not prove to be in the interests of either the public or the profession. For example, if a person should desire to teach mathematics, there has been no attempt to provide a protection for the teacher in mathematics that would differ from the general protection that a teacher should have to be a teacher. The same thing is true in medicine. It has not been necessary for a person to prepare by a license and an education for a specialty in a different manner than was required to practice medicine. In practically every instance that we have as an object lesson at this time, the tendency has been to have a general requirement which would safeguard the public and permit the profession to develop. While the matter of a new kind of registrant for the specialties has not been given much consideration in this vicinity and inasmuch as it originated in a state not known to have taken the lead in many educational aspects, we probably shall not give the matter serious consideration until we have found that the plans which we have now working are not practicable. Dentistry must be regarded as one of the younger professions that has had an almost independent existence since 1840, but it has within recent years become more closely associated with other educational institutions. Ten years ago not more than one fifth of the dental schools in the United States were integral parts of universities. Today from three-fifths to four-fifths are either integral parts or have working associations with universities. As the dental schools become integral parts of the universities, there is the natural tendency to economize in finances and make the teaching more effective by getting the fundamental work in dentistry done in a medical school. Moreover, some of the dental schools are finding it advisable to get some of the other work in the fundamental subjects done in other units of our universities. As these things take place, the other units of our universities recognize as never before the possibility of dentistry becoming not only an important factor in the health service of our country, but also an important factor in the educational program of our universities. This condition must be interpreted to mean a much wider understanding of the usefulness of dentistry through the outgoing graduates, thousands in number each year, from the universities of this country. If these graduates take to the people of this country the impressions that they have formed in the universities of the character of the work in dentistry, there is certain to be a greater obligation on the part of dentistry to keep its house in order, to work in coordination with other units of the universities and in coordination with our general educational scheme. There is no longer much opportunity for dentistry to do as it pleases, as it has done during the last eighty years. To ignore the tendencies in law, medicine, business administration, education, engineering and the other branches of education is no longer possible. While it may not be necessary for us to follow many of the details of the other professions, it seems logical to request, for the present at least, during the early stages of our development, that

dentistry profit by the experiences of the older professions. It is in this latter respect that I want to invite the attention of your organization, which has been more or less independent from the remainder of dentistry for many years, to the necessity for its recognizing that orthodontics is a branch of dentistry and that dentistry is a branch of medicine and of our general educational program. Dentistry is not different from any other education when it comes to fundamentals, and orthodontics is not different from some of the other specialties in dentistry. Simply because you are orthodontists is not a logical reason for the creation of some specialty that is different. You would not want to see oral surgery get requirements like the Arizona law, even in the modified form that the essayist has presented. You would not want to see prosthodontia or periodontia do the same thing. We have some attempts at the present time on the part of our mechanical dentists to do it, and I think about everyone sees the danger ahead if this should be done. For many years this large and influential organization of yours has been meeting independent of our national organization meetings. As a result, many of your members have not been familiar with the activities of organized dentistry. This has been a very easy thing for you to do, for dentistry itself has been obliged to lead an independent existence, but I hope you all realize that at the present time there is the strongest kind of a feeling prevalent that dentistry and medicine should get closer together than they have been in the past and that orthodontics and dentistry should get closer together than they have been in the past. Our dental schools have not known what to do about teaching orthodontics, for many of the teachers have formed their opinions about dentistry and its needs independent of the orthodontists of this country. The influence of the orthodontists upon the teachers' organization and upon the dental organizations in general in this country has not been great enough, and I am obliged to say that this, my first attendance at one of your meetings, has been at considerable inconvenience to me, but I wanted to show my sincerity in this matter and to begin the development of what I hope will be a better working relationship of organized dentistry with the orthodontists of this country.

The difficulty in which I find myself today, in an attempt to discuss the essayist's paper, is brought about by an apparent attempt on the part of the essayist to present an improved Arizona law which might be tried out, thereby giving me the impression that he would be willing to enter upon a plan such as he has presented. My experiences up to this time cause me to state emphatically that, until we find that nothing else will work, a specialist should first be a dentist. Not only that, but he should be a good dentist with much more information on the subject in which he specializes than the average practitioner has. It would seem to me, if the public were to pass any kind of a law for its protection, that instead of having the standard for a specialist lower than for a dentist, that it should be a considerable amount higher. It would seem to me that the public has a right to expect a person, who professes to be a specialist, to be all that a dentist is and much more. This raises the question of educational protection in another form, and it seems to me to be one which should not be attempted until we have tried out those which have been recognized in every other profession as sound.

I imagine I hear some one say that orthodontics is different from the other specialties in dentistry, and it is, therefore, a justifiable procedure to have a different kind of educational policy pursued than is pursued by some of the other specialties. Should anyone have this in his mind, it can soon be eliminated if the person will become associated with a good faculty of dentistry and will go into the development of the specialists of oral surgery, prosthodontia, periodontia and, to a less degree, into some of the metallurgical and operative specialties. As dentistry develops with financial support and educational guidance and becomes an integral part of universities, it appears at this time quite certain that orthodontics, which has taken the lead as a specialty, will be only one of several specialties with which our dental schools and our universities are confronted.

The importance of orthodontics is, I believe, all that the essayist has described. No one who has seen the work of some of our good students of this subject will fail to appreciate that orthodontics constitutes one of the finest services which dentistry can render. From an educational standpoint it furnishes an excellent subject for graduate study, and it will,

in my opinion, constitute one of the outstanding specialties of dentistry. In order to be a good orthodontist, it is necessary for a practitioner of this subject to become familiar with many of the related subjects in biology. It is not possible for a man to be an outstanding orthodontist without enlarging the amount of biologic education that is given in either dental or medical curricula today. Some of our experiences in the preparation of students during the few years that we have been studying the subject have led us to believe that while a year will permit of better development, that more than a year of study in the related sciences will furnish a background that is comparable in its scope and importance with some of the major specialties in medicine. On account of the ramifications of the branches of biology relating to orthodontics, there appears to be a grand opportunity for a well-balanced specialist in orthodontics to become interested in human nature in other ways than those directly related to orthodontics. Human behavior and its relation to our biologic development furnish so many interesting aspects of study that when one becomes once interested, there seems to be no end to it.

I mention these things to show the wholesome respect that I have for orthodontics as a specialty and to assure you that as we attempt the problem of graduate study in our school, we shall give the fullest recognition to the importance of orthodontics. I cannot agree with the essayist, however, if I interpret his presentation correctly, that orthodontics is so different or so important that we are justified in creating special acts in the legislatures of our different states for its protection and especially when such a suggested protection is on a lower level than is the practice of dentistry. We shall have four or five students doing graduate work in orthodontics this year, but in each case the requirement for admission to the work is a degree given on the completion of a good curriculum in dentistry. Upon this curriculum we hope to build a specialized knowledge of the service to be rendered and to interest these students in the broad relationships between this service and the services of the remainder of dentistry and medicine. If we were to prepare, as best we could, a so-called "specialist in orthodontics" in accordance with the Arizona law or the modifications presented by the essayist, I do not believe you would be satisfied. Your very useful and important specialty has developed entirely too far on the basis of a man being first a dentist, to take the retrograde step that would be taken were we to attempt to furnish orthodontists who were not qualified to practice dentistry.

Dr. B. E. Lischer, St. Louis, Mo.—I, too, received a copy of Dean Millberry's paper, but too late to prepare anything like the discussion the subject merits. I scribbled a few notes on the train on the way over here, where the temperature was probably 96 degrees most of the time and my thinking was not at its best.

It is a very hopeful sign when busy dental deans, as these two gentlemen are, will travel great distances and share their valuable time with us to help us solve our educational problem; and it is a problem in which all of us ought to be vitally interested. Education is a topic that deserves a place on our programs every year. And though we may not agree, let us not forget that this is a conflict of ideas, not of individuals.

At the beginning of the present century all the controversies of dental education seemed to be near solution. An ultimate goal and relatively fixed standards, or curricula, seemed to lie just around the corner. Today, the entire field of education is viewed as an ever-changing ideal; "concepts of educational values and methods are in a state of constant reconstruction, and the aim of education must be progressively redefined. Education has become a social function, and educational values are to be measured in terms of social efficiency." (Betts.)

Probably the available material and data will not permit a final statement in our own field. We may not come to any definite conclusions in orthodontic education today. Indeed, the essayist speaks of his recommendations as a transitional program. And he has very properly drawn a sharp line between such values as knowledge and culture, and those which combine to spell efficiency in the modern manner.

Orthodontic education occupies about the same position in dental education that the latter maintains in the family of medical education, that of a stepchild. A more intimate relationship is desirable, because the rise of the professional pursuits and the type they require are rapidly changing the educational functions of the state.

The proposal for a definite undergraduate course in orthodontics, such as Dean Millberry has made here today, may appear as a radical step, as an undesirable departure from existing standards. But dental schools are being rapidly incorporated in the universities, and I hope that this process will go on at great speed. The greater resources and facilities of these institutions of higher learning, their rich experience in all the branches of education and educational methods would seem to safeguard the quality of such instruction, and to guarantee that it would be no less than that received by the student pursuing a course in general dentistry today. With such courses available, as Dean Millberry has outlined, the usual objections to separate licensure for orthodontists disappear. Such a procedure may prove more serviceable than any previous method. Who shall say? I will not attempt to answer that. Time and experience alone can decide that.

If successful, it might remove the necessity for a graduate course in orthodontics; although I do not think many of you would be willing to give that up at present. If unsuccessful, it would strengthen the position of the advocates of the graduate plan.

Are we ready for this work? Are we willing to help in solving our educational problem?

Whatever our attitude and decision, let us not be guided by selfish, personal interests. Only as we participate in the social process of our day can we reach our largest success and richest personal development.

Dr. Martin Dewey, New York City.—I am certainly outclassed when you place me with these deans. I remember a little incident Howard told of a short time ago that illustrates my position very much, "I cannot think in the same language; I cannot find words to express my thoughts."

A short time ago two deans went on a fishing trip, and they had very good luck. They were out in a boat on the ocean. The fish were plentiful and they caught many. When they started back to shore, Dean No. 1 said to Dean No. 2, "You mark this place so we can come back here."

When they got back the first dean said, "Did you mark the place?"

Dean No. 2 said, "Yes. We fished over at the right-hand side of the boat so I put a mark on the right-hand side of the boat."

The other dean said, "You damned fool, we may not have the same boat again." (Laughter.)

When I hear some of this educational propaganda which has been promulgated in the last few years, it seems to me that no one seems to know exactly what he wants. Every fellow seems to have some pet theory, and he seems to forget all about one individual, the public. Your educational policies should not be to advance any plan of the individual, but should first be in the interest of the public. In order to protect the public you have to remember the educational economic proposition Dr. Ketcham mentioned in his address. There is such a thing as building up an educational autocracy which would be too expensive for the student and too expensive for the public.

I will admit now that I think Dr. Millberry is one of the first deans I have ever heard mention the public and take the public into consideration. The rest of the educational institutions think they are the only things that exist, and that all laws should be made for their protection, to protect their standards whether they are good for the public or not.

Regarding the legal protection of educational standards, Abraham Lincoln was certainly lucky he lived when he did because if he had lived in the modern time he would never have been president of the United States. We are getting educational standards today that are going to crowd the poor boy out of education. In fact, I heard the dean of Cornell University say a short time ago that the day of the poor boy was past when he could get an education.

I do not believe that is a wise thing. There should be opportunity provided whereby men should become educated and not be forced to follow some particular plan of education. It makes no difference where you get your knowledge, provided you get it. That was the condition prevailing during Abraham Lincoln's life. He did not gain his knowledge according to some plan prescribed by some institution. He gained his knowledge from the school of practical experience. I think that is the greatest school today. I can gain the knowledge of practical experience in the practice of orthodontics.

There are three ways a man can be educated to practice orthodontia. He can simply graduate as a dentist and by years of practice gradually improve himself to the point where he is recognized by his confreres as being specialized in that particular line as an orthodontist, or as a prosthodontist. He obtains a knowledge from his practical experience that places him above his fellow workers. The second way, which Dr. Ketcham mentioned in his address, is to be associated with some man in a special line of work. By years of study under this particular individual he can qualify and fit himself to follow a special line.

In Dr. Ketcham's address he referred to the American Board of Ophthalmology, Otolaryngology and Rhinology which was set up for the purpose of inquiring into the fitness of specialists who practice that particular specialty, and the duty of that board is to determine the qualifications of men engaged in that practice and their ability to give instruction to younger men. This board does not say you must take a certain course in a university, and that only. It makes it optional. It also investigates individual men who are capable of giving instruction, schools and hospitals capable of giving instruction and also courses in universities. When you limit that to any particular line or any particular institution, you shut men out from the field of practical experience, and that is not democratic. We are getting an autocracy. I think that is the greatest trouble in education as handed out by universities. They have become autocracies.

As an example, in the University of New York they have university extension courses which are given in the evening where students can take the subjects that are taught in the daytime. They require the same knowledge. The boy or girl who takes the university extension course is not given credit for that work toward a degree. In order to obtain a degree he must take so many hours at a certain time of the day. I consider that unfair to the boy, to the public, and to everybody. The question is: Do you know it? It is not a question of where you got your education.

I am very sorry to note that in dentistry and medicine, and it is becoming so in law, the first question the boards ask is, "Where did you get your instruction?" They do not ask, "What do you know?" but "Where did you get it?"

In New York state you have to satisfy the Board of Regents. It does not make any difference how much you know, you must pass the Board of Regents. A commission was appointed to confer with the Board of Regents, and the commissioner of education was holding out for preliminary requirements. It did not make any difference how much the man knew after he got the requirements. For example, the Vanderbuilt University, a Class A dental school, was not recognized in the state of New York. I happened to know a boy who graduated from the university dental work and had completed enough work to get in Cornell. He took his medical work at Cornell University. I said, "Would this man be entitled to take a dental examination?"

"No, he would not," replied the assistant commissioner of education.

He had many more hours of study and much more knowledge than probably 99 per cent of the dentists in the state of New York, and he could not take the dental examination because he did not have the preliminary education before he had the degree to enter Cornell and before he got his degree in medicine.

Such things as that are ridiculous, and that is what has sprung up under the head of legal protection of education. That is protection of education but not of the public. It is more important that an individual be qualified to practice his profession than that he have the required education.

The Arizona Law would license orthodontists to practice orthodontia. Dr. Ward has called attention to the three plans outlined in the Arizona Law. What is going to happen from a practical standpoint is this: If you practice in the state of Arizona (and I think the California Law includes a similar clause) for a certain number of years you can obtain a license as an orthodontist. If you do not obtain a license as an orthodontist prior to that time you cannot practice orthodontia. The limit of license may be seven years. If he neglects to take out a license in that time, he cannot take one out eight years after. He certainly knows as much in eight years after the law passed as he did in seven years, unless he has gotten very old and decrepit. Still you could not do it.

If you pass such a law as this for licensing orthodontists, you are going to make a lot of orthodontic bootleggers. I mean by that that you cannot enforce the law. How are you going to know when a man is practicing orthodontia in a dental office? When does the practice of orthodontia begin and dentistry cease?

Dr. Willett has shown you a case which might not be qualified as orthodontic in a strict sense. Many cases are coming to the prosthetic men when it is necessary to remove a certain number of teeth to make a restoration. Some of them are sent to the orthodontist, and the prosthetic man removes the teeth.

There are altogether too many laws now. We do not need laws for the protection of education; we need common sense for the protection of the public. (Applause.)

Dr. Guy S. Millberry.—I am very much pleased with the discussion. It shows a keen interest on your part in the subject of orthodontic education, with which probably most of you have had little occasion to become familiar. I dare say that very few of you who have been practicing orthodontics for a decade or more and have full knowledge of its growth have any conception of the amount of instruction that is given today in other fields of dentistry. They have gone ahead, just as your profession has gone ahead. If you are unfamiliar with that, you are not in a position to discuss the relativity of these changes.

Referring to the discussors' presentations, Dr. Ward confined his discussion very largely to the Arizona Law. The Arizona Law is not a product of the activities of the University of California. In a large measure, we have tried to inhibit the cause espoused by a few orthodontists in California. Not all of the group of men associated with Dr. Angle commend the plan as outlined in the Arizona Law. In general, they believe that if they could enact it there, where there are few dentists and orthodontists, it would not be so difficult to establish this program elsewhere, and, Arizona being near the top of the alphabet in the states of the United States, other states would follow.

While we have been greatly interested in California in the proposed law which emanated from Dr. Angle's school, I have submitted the comparison merely for your consideration.

The fundamental principle of orthodontic education should be to prepare men to take your places, who are better qualified than you are, with all due credit to each of you.

Most of the graduates of very recent years have not had anywhere near the amount of instruction in orthodontics that you had in your undergraduate and graduate courses. The pressure from the other departments, operative, crown and bridge, plate dentures, has crowded orthodontic education out of the curriculum today. That is the problem that presents itself to us. We are concerned with presenting for your consideration the problem of orthodontic education. This presentation is merely a problem for you to study. If you do not like this plan, it can be modified any way you choose, or any way the profession or faculties of the schools choose. We are not forcing anything on you and saying, "Here is a definite, infallible program." We expect it will change practically every year. Our teachers change their points of view. They do not repeat their lectures annually. They used to do so in the past, but this is no longer the case. All of our teachers are acquiring more knowledge of their subjects by association with you, with the practicing orthodontists and with the practicing dentists. What you have to offer to the teachers who are associated with you, and who are in this audience today, is the type of instruction that goes back to our students in orthodontics. Our function is to train men as orthodontists and as dentists. But can we do both at once?

The statement that Dean Ward made, viz., that a student can enter the University of California College of Dentistry without college physics is true. We recommend for admission to dentistry, as a part of the high school curriculum, zoology, chemistry and physics. No student in the University of California can take zoology, chemistry and physics in the predental year. He is not allowed to take so heavy a program. Any institution which offers three basic sciences, such as zoology, chemistry and physics, in one academic year is not giving adequate instruction in any, but merely a smattering of all.

Therefore, in our one-year predental curriculum we propose inorganic chemistry and zoology as required science courses. Even with these two science courses the predental pro-

gram is more difficult than the premedical program; it is only exceeded in difficulty by the engineering courses. Modifications of this program are under consideration.

As far as physics is concerned, I quite agree with Dean Ward that it is desirable, but the dental schools must draw the line somewhere. Each university should be privileged to establish its own curriculum in conformity with its own educational ideals and let the world determine whether it is right or wrong by judging of the capability and accomplishments of its graduates. It is the only way universities can develop.

The man who takes our two-year predental curriculum may take physics or he may take zoology. Chemistry, in our opinion, is more important than physics, hence we urge it in preparation for physiology, biochemistry and pathology.

If we enter the realm of biophysics, about which the physicist knows little or nothing at the present time, where are we headed in our preparation of men for the problems in the practice of dentistry? I wonder how much college physics Raper, McCoy and Ketcham had before they took up roentgenology.

One reason why I submit this plan is because it does not add an additional year of time to the course for the man who wants to become an orthodontist. I will discuss this briefly a little bit later.

Dr. Lischer has aptly stated that we all undoubtedly have different ideas in education. The applause which greated the various speakers here today confirms this statement. Most of you probably think it is an extremely radical program I am offering and you prefer the conservative, old, traditional plan. The mutineers in thought are the men who are unwelcome. Are you unwilling to accept any change in educational standards? Is this simple transition program so unpalatable to you that it cannot be considered? Will it uproot all your old, established views of orthodontic education or destroy their sacred values? It is proposed as a practical solution of the problem and submitted to you for study. Even if this proposed program were endorsed by schools, organizations or institutions, it would be six years before there would be any of its products before you and probably ten years before the problems could be worked out satisfactorily. What you plan to do today is rarely perfected tomorrow. It takes time and during the process of time changes will be made to meet your points of view with regard to education and orthodontic practice as well. So, while we may differ in our ideas, the fundamental purpose of training men to become better orthodontists is the primary object of all of us.

One discussor stated that the orthodontist is called the stepchild of dentistry and as such it has been treated in our institutions. This is in a measure the truth. In our effort to correct this state of affairs we have maintained graduate courses in our school during the past four years, and we find that it is impractical to take a practitioner of dentistry and teach him all he ought to know of orthodontics in one year's time. I believe this transition program is far superior to our present one.

Dean Ward says that a man should have much more knowledge of dentistry if he wants to be a specialist than this plan offers, and, therefore, he should practice dentistry for ten or fifteen years. Yet in less than one year's time, thirty-two weeks to be exact, he expects the student to gather all the knowledge necessary to practice orthodontics though he may never have treated a case. He cannot become oriented to the problems of orthodontics in a year's time. Under this transition program physics if desired can be taken in the first year instead of prosthetics and he can begin his orthodontic technic in the second year. In the third year he can take advanced orthodontic technic and clinical orthodontics, and in the fourth year he can carry clinical orthodontics only. The man with at least three years of orthodontic instruction will be far better prepared to solve the problems that confront him than the man at forty with fifteen years' experience, who wants to become an orthodontist in the shortest time possible. The poles are no farther apart than are plate denture work and orthodontic procedure, as now practiced.

Dr. Hoffman mentioned, as a tentative program, taking the regular dental course and adding a year of orthodontic instruction immediately after the student graduates. The student attends the dental school for four years and then, when he receives his dental degree, attends the orthodontic school and receives his degree of Master of Science. We have tried this program for four years and do not find it wholly satisfactory. We shall, however, continue it until a better plan is adopted.

Why should a student be required to spend 1050 hours, more or less, in plate denture prosthesis and 750 hours, more or less, in crown and bridge prosthesis, or a total of 32 per cent of his time in a professional curriculum when he will never use either phase of this training if he engages in the practice of orthodontics?

His judgment in these fields is not matured by this training, and his ability as an orthodontist is not materially improved.

How many of the men in general practice are doing their own laboratory work in prosthesis today? If you do not know, take a little time to make a survey and you will find reliable reports that 90 per cent of the dentists are sending all of their laboratory work out to the dental technicians. They start doing this immediately after they engage in practice. Most of the 90 per cent continue to do so later in life. Ninety per cent of the laboratory work the student is trained to do in crown and bridge and plate dentures is done by the dental technicians today. Then why train orthodontists to do this, when dental graduates discontinue it? This information comes to me from one of the largest, if not the largest, laboratory in the country.

You may not be cognizant of the fact that the dental laboratories are making diagnoses, classifying orthodontic cases, making appliances to treat them and sending them to any dentist in the United States. You can send any set of models of an orthodontic case to the laboratory, and they will give three diagnoses of the case and three methods of treatment. You can accept any one of the three you want, send your decision back to them, and they will make the appliances—one out of three chances to get the correct type of appliance for that case, provided they have made one correct diagnosis.

What happens to dentists who practice orthodontics in this manner? The first time anything goes wrong they say, "What shall I do next?" The dental technician from the laboratory is not there to counsel them.

Other laboratories, interested in casting gold and making all kinds of gold appliances, are proposing to enter the field to do orthodontic technic work for the dentist. Under such conditions the dentist will not be required to know anything about orthodontics; all he has to do is to take an impression, send it to the laboratories, and they will make the appliances with which he can treat his cases and for which he can collect his fee. Is that the kind of orthodontic education you want? Is that your conception of orthodontic practice?

The question of divorcing orthodontics from dentistry has never entered our minds at all. Orthodontics is just as much a part of dentistry as is oral surgery, the next most important specialty in dentistry. As far as the other specialties in dentistry are concerned, I cannot conceive of them as being other than a type of limited practice. Changing the lettering on the door does not necessarily create a new specialty in a profession.

You are the outstanding group of specialists in dentistry and you should give some serious thought to this question of education. It is the only means of preparing young men to carry on your work in the future.

So far as the open letter by Dr. Furby is concerned, I felt it would be unwise to send it out because it was not a clear enunciation of the ideals of orthodontic education as I conceive of them. Dr. Furby believed that if he could reach the 5,000 dentists in California and all the orthodontists in America through his open letter, they could be awakened to the necessity of adopting the Arizona Law, or something like it, and forthwith there would follow a change in legislation.

My concept of legislation in California is this: There should be a new section written into the dental law, comparable to the section in the law relating to dental hygiene. This section should define what an orthodontist should be legally qualified to do; what credentials he should present before taking the examination; what examinations he should take; and any other qualifications which he should possess. The dental law should include such general provisions as the annual license tax and registration, the suspension or revocation of licenses for violation of the law, the prosecution of illegal practitioners applicable to all licentiates alike, in terms of the wishes of the public as expressed by legislative acts.

This simple modification of the law need not create any marked disturbance either in our profession or the state. All branches of dentistry should be controlled by one board and

except for legal definition there would be no difference in practice other than there is by common usage and consent today.

Twenty-three states have sections dealing with dental hygiene in their laws; this has created no serious schism in dentistry and the majority of the hygienists are upholding the law. All phases of the practice of dentistry should be welded together in one dental law, under one board, where all the elements of the profession will work together for the uplift of dentistry as it is generally practiced today.

In New York state, a dental technicians' law was enacted and on the governor's table for signature before the dental profession knew anything about it. This law recommended a separate board for dental technicians. What will the next step be? The matter is out of the dentists' hands now.

I sincerely believe that if our educational institutions live up to their ideals and teach ethics and morals in practice—and by that I do not mean a full year of instruction in the subject of ethics, but enough to maintain our ideals by example as well as by precept—then the majority of the men and women in any phase of dental practice will follow them.

There will not be many bootleggers in your field of endeavor. You know that. This proposed program does not encourage that, because if a man is under the training of capable, competent orthodontic teachers for a matter of four years he is going to be imbued with the principles for which you stand.

As far as the poor boy studying orthodontics is concerned, which Dr. Dewey has mentioned, nobody has been concerned about the poor boy in advancing the educational standards in dental education. Why should we be concerned about the boy who wishes to become an orthodontist? This proposed transition program will offer better instruction and clinical experience in less time than any dental curriculum with a year of graduate study offers today and thus will be an advantage to the poor boy. They have not solved the problem of the poor boy in medicine. Of 587 applicants to the Washington University Medical School, St. Louis, about 85 can be admitted. Every year in the University of California there are 175 to 200 applicants for admission to the medical school and only 60 can be admitted. In a sense, they are creating autocracies. That does not solve the poor boy's problem. They still maintain eight years of instruction in medicine as a standard and some colleges offer nine. The solution of the economic problem of training orthodontists is not to be found in graduate instruction.

Since 1916, about $186,000,000 have been given by private sources to medical education and research, and in 1927 $100,000,000 of that sum was given for this purpose; not for hospitals or charitable, benevolent institutions designed for the help of individuals, but purely for medical education and research.

In the same period of time there has been only about $4,000,000 given to dental education and research and of that Northwestern University received about $3,100,000.

If the poor boy needs to be educated, and he should always have equal rights with the rich boy, then we and you ought to interest benevolently minded people in endowing our dental schools and offering scholarships that will help those men along.

I wish you to know that in the presentation of this subject I have nothing to sell. I hope I have brought to you an idea in orthodontic education that you will study. If this is not the proper solution of the problem, then your thought and our thought should evolve a plan that will result in a better education for the orthodontist and a greater protection for the children in the future.

I will be very glad, indeed, to leave the charts here where they can be studied during the period of the conference.

I thank you very much. (Applause.)

SHORT COMMUNICATIONS*

By C. S. Morris and S. G. Townley, England

MR. C. S. MORRIS read the following communication on "History of a Class III Case":

"This Class III case has been treated with intervals of rest since 1922 and is now complete.

"The condition when started was as is shown by the models in No. 1.

"An upper external arch was put on in that month. This arch had a wide German-silver band soldered inside it, 3/16 of an inch wide, in order to take the weight of the lip off the teeth.

"In December it was seen that the deciduous maxillary incisors were moving forward, as it was hoped that they would.

"In January, 1923, the deciduous mandibular canines were extracted in order to allow the mandibular incisors to fall back. In April of that year an upper Mershon arch was put on to push the permanent centrals forward. By November the alveolar process was developing well, with an upper central overbite 1/16 of an inch, as is shown by the models No. 2, when finger springs had to be put on to rotate the laterals.

"In November, 1924, the first deciduous molars in the mandible were extracted to allow the permanent canines to fall back. These came almost into line without any further treatment, but were still a little outstanding.

"In October, 1925, the second deciduous molars were extracted and a Mershon arch put on resting against the lingual sides of the mandibular incisors to keep the molars from travelling forward in the normal way. By this means the whole of the space occupied by the deciduous molars was reserved and the mandibular canines able to fall back in normal relation with the rest of the arch.

"In February, 1926, the maxillary second deciduous molars were extracted as the first molars were inclined to erupt behind the mandibular molars, and were in danger of being locked there. These rapidly travelled forward, and then a Mershon arch was put on the top to keep them there.

"An arch was still being worn because the second maxillary right premolar had erupted on the palate, and was not yet in position when the case was shown at the November meeting, as is shown by the models."

DISCUSSION

The *President* said that he would like to inquire whether the maxilla was undeveloped, and if the mandible was overdeveloped. He gathered that Mr. Morris had not used any intermaxillary traction in the case.

Mr. Morris replied that he had not.

Miss Possener inquired whether Mr. Morris had given any expansion to the maxilla.

Mr. H. C. Visick remarked that it struck him as being an astonishing thing that the

*Read at a meeting of the British Society for the Study of Orthodontics, 1927.

Fig. 1.

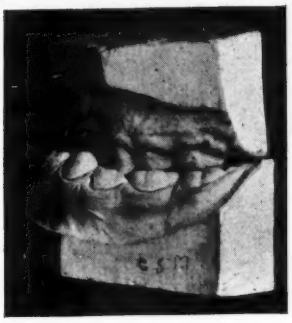

Fig. 2.

Fig. 3.

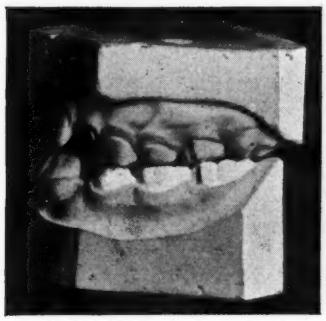

Fig. 4.

Fig. 5.

Fig. 6.

front teeth were not more inclined after having been pulled forward. From the appearance of the first model one would imagine that in pulling the centrals forward they would be tipped right out, and he did not quite understand how they had not got tipped out.

Mr. H. Chapman asked Mr. Morris whether, when he had put on the buccal arch in the first instance to hold the lip out, any inconvenience to the lip had resulted from that? It seemed to him that if the lip were actually causing pressure on the maxillary incisors, the lip would press equally on the arch, and a great deal of discomfort arise. Did Mr. Morris use any apparatus at all on the mandibular teeth? He congratulated Mr. Morris on the excellence of his result, and the ease with which he had obtained it.

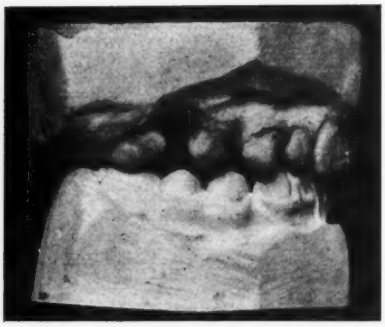

Fig. 7.

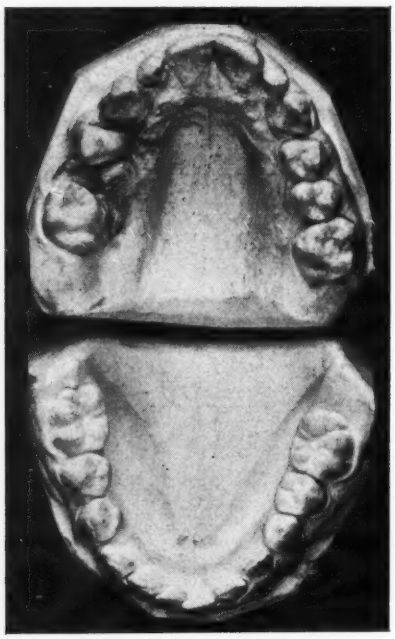

Fig. 8.

Fig. 9.

Mr. B. Samuel said he desired to give his meed of praise to Mr. Morris, on the fact that Mr. Morris had not found it necessary to take the advice which had been given him at the former meeting, of extracting several teeth. The case went to prove that it was not necessary to prop and gag the bite in order to bring the maxillary incisors over the mandibular teeth.

Mr. H. C. Visick, adding to his previous remarks, said that as Mr. Morris had had to wait for a year or two, as the patient was so extremely nervous that he could not fit any appliance in the mouth, he (Mr. Visick) wondered why Mr. Morris had not tried a chin-cap and a head-cap. Personally he had treated one Class III case at the age of 18 months.

By fitting a head-cap and a chin-cap for less than three months, the patient had had his jaw pushed back into position. The boy was now about 12 years of age, and his teeth were perfectly normal. From his experience in that case it occurred to him that the earlier one could start on such cases the better. He had had one other case on which he had commenced at four years of age, and that had also gone off very well.

Mr. B. Maxwell Stephens said that his partner, during his absence on one occasion, had treated for him just such a case as that which Mr. Morris had described that evening, but in doing so had made use of the chin-cap. What was now particularly noticeable in contrasting the two cases was the absence of growth anteroposteriorly, and the advantage of the natural sequence in development brought about by the method of treatment Mr. Morris had adopted. If movement forward in the premaxillary region was not obtained, then there was apt to be a lamentable imbrication of the mandibular incisors.

Mr. H. G. Watkin stated that he had had a case, age three, on which it had not been possible to put much appliance. The case was not so much exaggerated as Mr. Morris' case. All that it had been necessary to do had been to put two small inclined planes on the maxillary central incisors, and in a very short time that had brought the maxilla forward, and in about three months the jaw was normal.

Mr. C. S. Morris, in reply said he had not used any intermaxillary traction at all, and he had not used any expansion except what he had done with the finger-springs on the Mershon arch on the maxilla in order to carry the incisors forward in the normal position, and also the canines when they erupted later on. Mr. Visick had asked whether there had been any tipping. There had been no tipping—for two reasons, one being that he had started as soon as ever he could get a finger-spring on to the incisor tips, and the other being that the patient began to develop the alveolar process which carried the roots of the teeth steadily further forward. At one stage the incisors were certainly more tipped than they are at present. Mr. Chapman had asked about the pressure on the lip. He (Mr. Morris) had expected to find the deciduous molars move back a little if there was going to be much pressure on them, but it had not appeared to have had any effect upon them whatever. The band was three-sixteenths of an inch wide; it was no use putting a narrow band on. He had not put on any apparatus at all to pull back the mandibular incisors. They fell back from the pressure of the lower lip. What he had been anxious about was that the molars might tip forward when the deciduous molars were gone and deprive him of the room necessary. He had had to get the canines and premolars in position, so he had put on a Mershon arch resting against the incisors below and had kept it there all the time. That was all the apparatus he had used below. He noticed that at one time the patient had a tendency to crumple up her incisors—he supposed under the pressure of her lip. Therefore, he had kept a finger-spring on the left mandibular lateral. He had not had to do any extraction at all to make room. That point had been debated two or three times, but nothing had been done. Mr. Visick had asked about a head-cap. When the patient had first come to him he had thought she was just the child on which to fit a head-cap; but the more he looked at her the more he had thought that the condition was not due so much to the position of the mandible as to the condition of the maxilla, and had not put on a head-cap. He had thought that if he could get the maxilla developed he would probably cure the case. Mr. Maxwell Stephens had mentioned the necessity of having the expansion on the maxilla as well as retraction by a head-cap. Personally, he had not had much experience of such cases, and he could quite imagine that that would have to be done in order to get a good result. Mr. Watkins had referred to the inclined plane. Probably all the members had treated quite a number of cases with an inclined plane in which they had got the commencement of a Class III case by there being two centrals inside the lowers. He thought most of such cases if left alone would gradually become Class III cases. He thought that with an inclined plane or a Mershon arch the maxillary incisors would go over the mandibular incisors without the necessity of having to raise the bite at all, and the case would nearly always cure itself automatically.

Mr. S. G. Townley then presented a short communication, illustrated with slides. The patient, a girl of eleven years of age, had been brought to him with a swelling in the palate. He found that the swelling was due to the eruption in the palate of the second premolar. The second premolar was just coming through, but the deciduous molar was in place. He had taken an x-ray photograph, and found there were no roots to the deciduous molar, and, with some difficulty, had extracted it. It had been a very difficult operation, because the deciduous molar was hopelessly wedged between the six and the four. The six was very badly tilted forward. The articulation on the other side was quite satisfactory, but on the one side it was obviously very bad. What had seemed to him to be difficult was how to straighten up the six without opening the bite. The four had drifted back, and could be brought forward, and he thought the five would come into play; but he did not quite know how to strengthen up the six without opening the bite. He did not know why the deciduous molar had never erupted. He invited assistance in the matter.

DISCUSSION

Mr. H. Chapman said the space for the second premolar could be opened up by means of a spring attached to the first premolar and the molar—that spring being attached by means of half-round vertical tubes on bands. The opening of the spring there would probably move the first premolar more than the molar, but he thought the anchorage could be quite easily made sufficient by means of a lingual arch attached also on both sides, and with spurs in the appropriate places to get resistanec from the other teeth. He did not think Mr. Townley would have to open the bite in order to do that. He did not see why the molar should not be moved back without great difficulty. His colleague sitting next to him suggested that the deciduous molar had erupted and probably had got squashed down in some unaccountable way by the teeth next to it.

Mr. C. S. Morris said he thought that that was actually what had happened. One had seen a number of cases where the deciduous molars remained at the same level as they had always been. When the alveolar process deepened they seemed to be left behind. It was not always the fact that they were left behind, because the first molar was sitting on their tails; but he had seen two deciduous molars side by side doing the same thing—an eighth of an inch off the lowers.

Mr. S. G. Townley said the only point which had struck him about it had been that he had thought that if the six-year-old molar was rotated backward on its apex it would be bound to open the bite. Mr. Chapman said it would not, and if Mr. Chapman said it would not, he was sure it would not; but if it was brought perpendicular surely it would be longer than it was at present, and, if it was already in articulation with the mandibular molar, he could not quite see why it would not open the bite, at any rate temporarily.

DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

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A CONSIDERATION OF FRACTURED ROOTS OF TEETH, BASED UPON A STUDY OF THE CAUSES FOR THEIR FRACTURE AND THE METHODS FOR THEIR REMOVAL*

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A LOGICAL introduction to a discussion of the technic for the removal of fractured roots is a brief consideration of the reasons why roots fracture.

AVOIDABLE FRACTURES

1. Incorrect position of patient, operator, and operating chair.—Just as it is important to assume proper stance in golf or in tennis to approach and to receive the ball effectively, equally significant is it in exodontia for proper positions to be assumed by the operator, his patient, and the chair. The relationship must be exact or the result will often be failure.

For operations in the maxilla it is best to have the operator's right shoulder in line with the patient's head. For operations upon the mandible, the operator's right elbow should be in direct horizontal line with the patient's mouth.

The chair should permit the patient to sit comfortably with the head always facing forward, the back only slightly tipped backward. I have heard much about "Keep your eye on the ball." I now pass that slogan on with slight amendment: "Keep your eye on the patient and the tooth." This can best be done by standing forward of the patient, as does the general surgeon. By keeping the operative field always in direct vision the operator is at a decided advantage in all exodontia operations.

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Dentists have a well-earned reputation for working in uncomfortable attitudes. In no branch of dentistry is this attitude so disastrous to the operation as in exodontia. So much depends upon the proper poise of the arm and the instrument for tooth delivery; so much depends upon the proper support which the operator and his assistant must give to the patient's head and jaw during the exercise of greatest stress.

2. Incorrect application of the instrument to tooth. (a) Coronal aspect.—When the beaks of a forceps are applied in such manner as to have the forceps and the tooth not in direct axial relationship, there will be fracture. Tooth and instrument should form a straight line angle. The instrument should be of such design as to permit the operator to *see* the tooth. That may sound a bit strange, but it is important when one is operating on mandibular molars and premolars, and assumes the generally taught position behind the patient. No wonder that so many teeth are fractured. I do not hesitate to commend that type of forceps which I have found supremely satisfactory in my practice, namely, the Claudius Ash pattern. With this type of forceps, the operator is enabled to visualize the tooth at all times, even when the extracting maneuvers are going on.

(b) Root aspect.—When the beaks of a forceps engage only the coronal aspect of a tooth which is quite carious, there may be fracture. The beaks should always be applied to the cemental portion of the tooth. This necessitates in most cases the application of the beaks over a portion of the alveolar investment.

3. Incorrect direction of extracting force.—The discussion of this phase of exodontia might well merit an evening for itself. Sufficient to mention here that there are many avoidable fractures resulting from the operator failing to direct his force in the proper direction. Levers are used as wedges when forceps would be more advisable, and teeth are carried toward the "thinner alveolar plate" when in the particular case in hand that technic must result in failure. The fallacy of this policy is nowhere better demonstrated than in the handling of the four maxillary incisors. Students have been taught to carry the tooth toward the "thinner alveolar plate," i.e., the labial. Not only is there a direct invitation to root fracture here, but also there is the worse condition of contused and displaced alveolar and soft tissues.

I have found that a slight rotation of the maxillary incisor, with pressure against the palatal process, is effective in accomplishing its successful delivery, unless the tooth has been reamed out for dowels or posts.

The maxillary canine should in nearly all cases have its labial soft tissue investment dissected from the bone at least one third way up on the root before forceps application is made. The force for delivery is straight down in the axial line of the tooth. Sometimes a slight rotation movement is effective when the bucco-palatal diameter of the root is not too great.

I draw down the maxillary premolars and molars in nearly all cases. Only a few teeth require bucco-palatal jarring before downward traction is brought into play. Frail roots are thus frequently delivered without fracture, where to carry the teeth outward toward the "thinner alveolar plate" would invite prompt fracture.

Mandibular incisors are drawn upward without any deflection from their axial line. Canines are grasped firmly below the gingival border, and pressure is brought to bear against the lingual plate as the forceps at the same time are brought up for delivery. This not only prevents root fracture but also lessens the danger of soft tissue laceration labially.

Premolars and molars are jarred in their alveoli as upward traction is brought into play. Unless there is morphologic abnormality, this technic is successful.

4. Too large instruments.—In the handling of maxillary molars, fracture by virtue of the use of too large so-called "molar forceps" frequently results. Large instruments are not advisable; smaller forceps add to one's sense of touch. Delicacy of manipulation is important. Few teeth require excessive strength for their delivery.

I use no molar forceps for the removal of maxillary molars. The bayonet type usually used for premolars suffices for the molars as well. The old No. 101 S. S. White forceps, now made by the Claudius Ash concern is the instrument strongly advised for this operation. I induced the manufacturers to modify the handles in the interest of a better grasp.

When an operator uses a large heavy molar forceps, he cannot very well secure adequate root purchase which is so essential for all extractions. Then when the crown fractures, he lays aside the instrument and takes up the narrower beaked forceps to complete the operation. The author may well ask then: "Why not commence at the outset with the narrow-beaked instrument?"

5. Imperfect anesthesia inducing haste as the patient shows signs of extreme agitation.—Whether one is operating under a local or a general anesthetic, this is a factor in inducing fractures which might otherwise not occur. Local anesthesia should be tested before operating commences, and general anesthesia should be so induced as to permit of the freest exercise of extracting movements by the operator. Operating in the excitement stage obviously is unwise. The tooth is grasped, and before the operator can properly adjust his instrument, the agitation of the patient causes him to make premature extracting movements. Firm grasp of root surface by the beaks of the forceps is essential for a complete and deliberately planned operation.

UNAVOIDABLE FRACTURES

1. Root curvatures.—Unless there is soft alveolar tissue or local inflammatory condition, curved roots usually fracture. If the bone is very dense, this will occur. Frequently curved roots do not fracture. Proper technic undoubtedly accounts for this in great measure. But one is not to be censured for fracturing what appears beforehand to be an unavoidably difficult tooth.

2. Exostoses of apices.—Here likewise, unless there is a soft bony investment, there is usually an unavoidable fracture. The same condition prevails as concerns hypercementoses of roots, root anomalies, and attenuated and ribbon shaped roots. Their delivery without fracture only ensues when their bony bed is not too resistant.

3. Excessive calcification of bony investment or hyperplasia.—When jaws are densely calcified, fracture of roots is frequently unavoidable even with the

best of operative planning and execution. Similarly, when root canals have been treated for the removal of organic elements, brittleness of tooth structure greets the forceps. Roots which have been reamed out for the reception of dowels, posts and pins are surely a problem to the average operator. I advise a reflection of the mucoperiosteal flap before forceps application. Since fracture is so imminent, why not be prepared in advance for the open-view operation which eventuates upon primary forceps application?

OPERATIVE TECHNIC

Importance of diagnosis with x-ray readings.—The x-ray is of value in giving to the operator advance information as to:

1. Length of root.
2. Morphology of root and apex.
3. Relationship to adjacent teeth.
4. Relationship to important anatomic structures such as the maxillary sinus, the mandibular canal and the mental foramen.

These factors are very important. The nature of the technic to be employed in the operation depends upon the classification of fracture that exists.

CLASSES OF ROOT FRACTURES

I make the following classification based upon topography and history.

For teaching purposes, such classification helps the student to visualize descriptive talks and aids in the choice of proper operative procedure. There are four classes of root fractures. These do not include the accidents which propel roots into entirely foreign territory such as the maxillary sinus or the soft tissues about the floor of the mouth. We are concerned here only with the roots which are retained in their alveolar investment.

Class I: This class would embrace a recent or old fracture where the root is visible to the operator at the surface of the ridge.

Class II: A deep fracture of a recent operation would come under this classification.

Class III: Under this grouping would be included old fractures where the roots are at the surface of the ridge but require the reflection of the mucoperiosteum for approach.

Class IV: Deep fractures of old operations would be identified with this group division. Mucoperiosteal dissection would be likewise indicated for these operations.

OPERATIVE TECHNIC FOR ROOT FRACTURES IN CLASS I

(1) Accessibility to forceps reapplication.—Accessibility to forceps reapplication depends upon the thickness of the buccal or labial alveolar plates.

The first thing an operator does when he fractures off a crown of a tooth, as a rule, is to endeavor to push the beaks of the forceps further beneath the gingival border to obtain deeper purchase on the bone overlying the fractured root; that is, if the root fractures at the gingival border. Any deeper fracture

is ruled out of this technic for the time being. Now then, if the bone is very thick, and in some cases goes off at quite a distinct angle, much difficulty would be met when the beaks endeavored to pass downward under the mucoperiosteum. Many roots fractured at the gingiva give the operator no trouble at all when deeper engagement of the root is made. But when the obstinate case is at hand, the unavailability for forceps technic necessitates other means for the removal of the bone to make ready access of delivery force.

(2) Means for the removal of alveolar tissue to make access for lever technic.—There are three methods which may be used for the delivery of roots in Class 1 fractures. These are:

(a) Hand pressure chisel force,
(b) Chisel and mallet force,
(c) Motor drill force.

(a) Hand pressure chisel technic.—Mucoperiosteum is elevated from the alveolar plate always on the buccal or labial aspect. This makes for a simpler operation and minimizes trauma to nourishing blood vessels and nerves found lingually and palatally.

The hand chisel is used to remove bone in order to facilitate the approach to the root with the lever. The chisel must be very sharp and the pressure of the hand extremely insistent. I object to this technic for the reason that it requires considerable strength for the average operator to exercise. In the absence of other agencies hand pressure chisel technic would be welcome, of course. But I consider this a rather difficult means when there are simpler ones at hand.

(b) Chisel and mallet force.—With the mucoperiosteum reflected, the outer alveolar plate is removed with blows of a mallet directed against sharp chisels in contact with the bone encasing the root. The lever is then introduced to remove the root. In the hands of the average dental practitioner, this is also a difficult technic. Familiarity with surgical chisels and mallets is not within the reach of the average general practitioner. This is a technic for the skilled surgeon. Properly executed it is a good technic. But there is this objection so far as my opinion is concerned: the blows against the bone are conducive to surgical psychic shock. It is not a pleasant experience to have mallets rain blows against one's jaw. If another technic can remove the root without this objection, it would seem to commend itself to more general approval.

(c) Motor drill force.—With the mucoperiosteum reflected and held back by the finger or with a blunt periosteal flap retractor, I introduce a flat spear drill into the alveolar plate to engage the root. A very delicate elevator is used for this operation. I formerly used the Crane Pick for the lever function, but recently have taken up the H. J. Field Pathfinder and my own improvement on the Crane Pick, known as the Patholever. The lever engages the root and lifts it free of the socket. The rongeur forceps then trims away the bone to make smooth healing, and the flap is returned to position.

So far as the Class 1 fractures are concerned, the technic just described will be found available for single-rooted teeth. When multi-rooted teeth are fractured at the gingiva, the drilled path is made at the bifurcation and

directed at a forty-five degree angle downward sub-gingivally. The lever is then applied and used as a wedge with mediodistal arcing movements of the wrist for lifting force. Sometimes both roots are loosened. When only one is freed, the exolever is applied to the retained root through the avenue of the vacated alveolus. If the septum is thick and the operator experiences difficulty in cutting through to the root, I advise making another opening in the alveolar plate directly adjacent to the retained root. The reapplication of the lever here will yield the root.

I make two paths in the bone when I realize at the outset that the thick septum will give trouble. When the drill is first introduced at the gingival border in the bifurcation area, it is directed toward one root and then withdrawn and from the same starting point directed against the second root.

When the maxillary molar is fractured, the application of the drill gingivally, at the bifurcation, upward and inward, at an angle of forty-five degrees is just as effective as when the technic is employed for mandibular molars. The Pathfinder or the Patholever is used here in the same manner as described for the mandibular molar roots, to split the tooth. Once the operator frees part of the tooth, the further delivery of the rest of the tooth is facilitated.

The technic just described is applicable to almost every tooth in the mouth. Take for example the case of a cuspid in the maxilla. The crown has crumbled off due to caries from a broad palatal lug of a bridge made to rest against the tooth. The bridge is not yet to be removed. For one reason or another, it is to remain undisturbed. The removal of the root is effected by entering with the drill through the labial plate into the cementum, following, of course, a preliminary mucoperiosteal flap reflection. The lever will carry the root downward with no difficulty and no disturbance to the lug or the bridge. This is only a single instance of how useful this technic can be. It is equally effective and conservative for the removal of roots under bridges where it is desired to retain the appliance already in the mouth.

OPERATIVE TECHNIC FOR ROOT FRACTURES IN CLASS II

For the removal of a deep root fracture of a recent operation, the first step would be the dissection of the soft tissues away from the alveolar plate labially or buccally. The lines of incision should be at an angle rather than at right angles to the gingival border. The line of incision should extend over onto the extra-operative area. The reason for this is that when the tissue is replaced it is best not to have the flap fall away from and expose the bone margins.

After the mucoperiosteal flap is peeled off the bone to a sufficient depth to permit a free operable area and a good view of the entire field, the alveolar labial bone is removed with a rongeur forceps up to the fractured root-end so that the operator can see the root distinctly. This is important. Too many instances come to light where the operator has fought his way blindly within the alveolus, vainly endeavoring to dislodge what is impossible to see under the bloody conditions present.

The technic just outlined is applicable to all root fractures with the exception of those which occur to the mandibular molars with little apical spread of roots. For these fractures the introduction of an exolever into the vacated alveolus and applied with force against the wall of the septum toward the retained apex is readily effective. It must be borne in mind, however, that the fulcrum must be the buccal alveolar ridge rather than the proximal alveolar wall, as I have had frequent occasion to find being done. That would account for the discomfort of varying severity which patients suffer, to the apparent mystification of the operator who keeps insisting "The tooth is all out," yet the patient is suffering intensely. Of course the patient would be suffering intensely from severe misplaced fulcrum stress. Osteitis, with a painful course sometimes progressing to suppuration and sequestration, is a frequent sequel to an extraction which quite removed the tooth.

To come back again to the deep root fracture. The flap is reflected and the bone removed to expose the root surface; the next step is to apply the flat spear drill to the buccal alveolar wall in line with the root. The drill penetrates the bone and enters the root only slightly. If too much penetration is made with the drill, there will be fracture of the root when lever force is applied. The lever is introduced into the bone path thus prepared, and delivery by way of the socket is made. With a rongeur forceps the bone margins around the drilled opening are trimmed down so that the appearance of the alveolar buccal space could be described as having the shape of the letter U.

A very troublesome type of fracture is that which occurs in the case of the maxillary first premolar. There is usually an attenuation as well as an apical spread of the roots of this tooth.

Should both roots fracture at a point quite near the apices, the technic already described would apply: That is, reflection of mucoperiosteum, removal of labial alveolar tissue as far as the roots, and the application of the drill labially through the alveolar plate for the introduction of the lever which will send the roots down.

Should the palatal root still remain embedded, the drill is then applied through the septum separating the labial from the palatal apex, and the drill guided to a point where the lever will slightly engage the palatal apex. The introduction of the Patholever at this joint in most cases promptly delivers the apex.

It is not unusual for me to come in contact in my practice with cases of this nature where the operator in endeavoring to remove one of these apices with levers directed from below upward has dislodged the fractured apex either into the space between the labial periosteum and the soft tissues or into the maxillary sinus. The technic of the drill as advocated in these operations and similar ones elsewhere in the mouth, especially for the delivery of fractured lingual apices of maxillary molars, would prevent such an accident. Frequently it is my experience to find that the vibration of the drill is sufficient to expel the apex even before lever force is applied.

If, upon initial application of the drill and lever, immediate delivery of the root fragment is not effected, a secondary opening is made more apically for deeper engagement of the retained fragment with the lever.

In returning the mucoperiosteal flap to position, the operator is concerned with two clinical problems: First, not to permit lateral bone wall margins to remain exposed and denuded of their protecting soft tissue covering; and second, not to permit a drawing away of the mucoperiosteal flap during lip and cheek play. In the former instance, there will be pain and sequestration; while in the second instance, there will be depression and deformity to interfere with proper restorative procedures subsequently. Removal of roots always must proceed apace with due regard for the problems of the mechanical and esthetic considerations of dental practice.

In returning to its original position the previously reflected mucoperiosteum, the operator must note whether there will be a tendency of the soft tissue to draw away from the line of incision. In that event suturing is advised to coapt the parts. In some instances it is possible to coapt the severed tissues without resort to suturing. In these cases, the author introduces a vaselined dressing into the cavity and brings the flap to position against the gauze acting as a matrix. If after ten minutes of compression, the blood has coagulated and the flap is in position when the patient rinses the mouth, the operator may feel fairly justified in dispensing with the suturing. The following day the dressing is removed and the flap reunited.

In suturing, the operator should make sure that he is not causing tension to the tissues he is rejoining. Tension usually is attempted when the operator has caused the soft tissue loss during the operation for the primary fracture. He thus endeavors to draw together the mucous membranes to cover exposed bone which, in the nature of things, cannot be covered up. Such wounds must heal by granulation, and there must be that unavoidable depression that results from such healing.

I do not introduce a dressing in every case. There are certain definite rules for dressing, which if carried out will avoid for the patient and the operator many unpleasant experiences. They are as follows:

1. Dress all wounds when local anesthesia has been employed for the operation. The reason for this is because of the deficient blood clot and the danger of infection to exposed or poorly protected bone. There is likewise always danger of postoperative hemorrhage when the blood circulation resumes its normal current several hours later when patient is beyond the aid of the operator.

2. Dress all wounds which are extensive.

3. Dress all wounds which have been subjected to considerable trauma. Here it may be reasonably expected that the patient is going to suffer postoperative discomfort. Dressing will tend to minimize the severity of the period.

4. Dress all suppurating cavities whether acute or subacute.

5. Dress tightly all wounds which show a tendency to sustained hemorrhage.

6. Dress lightly all wounds communicating with the maxillary sinus.

It might appear from the foregoing that there are no wounds from which dressings may be eliminated. For those operating under local anesthesia the rule does seem to be universal. I made the definite statement that all wounds

resulting from local anesthesia operations should be dressed. But for those who operate under general anesthesia, dressing of wounds is not so necessary. The free hemorrhage of the operation floods the cavity and gives rise to a healthy clot which in the vast majority of cases forms the basis of a healthy granulation tissue. The operator cannot always determine whether his patient is a hemophiliac if the extraction has been performed under a local anesthetic. The reason is evident; artificial stypsis has been performed. He does know the coagulative nature of the blood immediately upon the completion of the operation if a general anesthetic has been used.

I wish here to stress the differentiation between dressing and packing. A packing is used only to control hemorrhage. All other occasions for the introduction of palliative medication into a wound are dressings. Lightly introduced, a dressing will serve the function it is intended to serve. Introduced under pressure it may be etiologic of severe pain and swelling.

OPERATIVE TECHNIC FOR ROOT FRACTURES OF CLASS III

The first step in the operation for the removal of a root fracture in this division is the reflection of the mucoperiosteum buccally or labially. This permits of the introduction of the beaks of the forceps for the root delivery without soft tissue laceration. It may also afford lever entry if that technic is decided upon by the operator.

Where the application of the forceps will evidently cause too much lingual or palatal bone loss, the drill serves quite effectively to permit of buccal or labial approach by means of the lever.

It is well to bear in mind that the drilling of the bone path should be made at an angle into the root substance. This permits better fulcrum functioning.

If the bone is soft, lever delivery without drill preparation is equally effective. Dense bone, however, must be removed whether chisel and mallet, or drill be the instrument of choice.

OPERATIVE TECHNIC FOR ROOT FRACTURES OF CLASS IV

The technic of operation for deep root fractures of old history differs from that outlined for Class II fractures, or deep fractures of recent history only as regards the amount of bone to be removed. The reflection of the mucoperiosteal flap to expose the bone area and the removal of the overlying bone constitute, as stated, the two steps for achieving approach to the root. I recommend the encircling of the root with drilled openings, and then connecting these with sharp hand instruments to create a window. In some cases, the bone is removed all the way from the alveolar ridge to the root. In some cases it is possible to cut a window far removed from the ridge, and delivering the root fragment through this opening with no disturbance to the ridge contour. This would be an advantage where early restorative procedures were desired, or where restorations already present are to be preserved.

Openings in the bone should be made closely approximating one another. During the operation, frequent flooding of the operative field with normal saline helps to prevent the effects of bruising bone. In effect, they practically

produce one large bone path. A curette easily dislodges the bone encompassed. The usual engine bur would be more apt to overheat due to the longer contact of drill and bone for a continuous sectioning. The advantage of the repeated entry and withdrawal of the spear drill is in establishing bone contact for short periods. This eliminates heating of bone. Then again, the fact that all bone which has been in drill contact is removed with rongeur forceps during the postoperative bone trimming also assures to the operator the removal of every element of injured bone.

Following all surgery where the drill has been used to any possible severe extent, the author irrigates the wound again with hot normal saline solution. This always helps in establishing health in the area.

OPERATIVE TECHNIC FOR ROOT FRACTURES WHICH ARE THE SEAT OF ACUTE PATHOLOGIC DISTURBANCE

When an acute pathologic disturbance involves the area of a root fracture, there is always danger of spreading trouble. We never know when there is an osteomyelitis present or on the way. Early stages are not very clearly demarked. The safest procedure always is to establish drainage and operate in the subacute stage. Of course, there are those who will say that to establish drainage properly, one must remove the root which is causing the disturbance. There is justice in that stand. Only mature judgment can dictate the proper procedure in a particular case, and usually mature judgment is based on experiences with similar conditions in the past where error of judgment was deplored and regretted by the operator. Mistakes are always deplorable, yet it is not possible to go through a period of any considerable extent of work without confessing to omissions and commissions in the practice of a specialty where the slightest deviation from certain procedures may have serious result. But this much is certain, to operate in the acute stage may frequently result favorably; to perform the operation in two stages, first establishing drainage, and then completing the root delivery in the subacute stage of inflammation is *always the safest technic*. One cannot go wrong by adhering to this principle of surgery. Nature's invisible protecting barrier in the subacute stages is always present to guard against the spread of infection which is a menace to uneventful recovery in all acute-stage surgery.

OPERATIVE TECHNIC FOR ROOT FRACTURES IN INDIVIDUALS WHO HAVE JUST BEEN SUBJECTED TO A SEVERE OPERATIVE ORDEAL RESULTING IN THE UNSUCCESSFUL EXTRACTION WITH ITS RETAINED ROOT COMPLICATION

Frequently patients are referred to the specialist for the removal of roots which have remained in the jaw following an operative ordeal of an hour or more. These individuals are already suffering considerably from psychic shock. At the very least, they are admittedly somewhat distraught.

To continue the operation for the root removal under a local anesthetic means the unnecessary subjection of the individual to added mental excitement. Patients under these circumstances long for a general anesthetic. If the continuation of the operation begun by the dentist could be effected under a general anesthetic, the added pounding on the jaw could be spared the

agonized patient. Of course, enough morphine and codeine could be administered to put the patient in a stupor which might permit continuation of the operation under a local anesthetic. But what would be gained in most cases? So much can be accomplished under general anesthesia that the author sees in its neglect by the profession only a sad confession of inability to develop a technic which is suitable for general anesthesia. Chisel and mallet technic may be very well carried out under general anesthesia. But it unnecessarily complicates the operation. It means more hands in the mouth, a limited operative area at best. The drill technic is simple and permits the operator to work alone in the mouth to an extent not possible with chisel and mallet technic. Perhaps in this lies the reason for the neglect by the profession in general to make more use of general anesthesia in exodontia. The technic of being able to recover a fractured root under a general anesthetic has not been simply taught in the past. I firmly believe, in the light of a vast experience, that general anesthesia for these operations is preeminently superior to those performed under local anesthesia.

In conclusion, I wish to emphasize the simplicity of the drill technic and to declare it to be as truly surgical a procedure as the chisel and mallet. For brain surgery, there is no better instrument given to medicine in removing the bone of the skull for entry into the cerebral regions. For open reduction of long bone fractures, there is no better instrument for the orthopedic surgeon. For the reduction of jaw fractures where there has been extensive loss of bone substance there is no better instrument than the motor drill for the preparatory work of silver-wire ligation. The heritage of the drill is as dignified as the chisel and mallet. One need not feel that it is necessary to impress unduly the patient with the severity of the operation by substituting chisel and mallet procedure for drill technic. I hope that a more general acceptance of drill technic may bring many happy moments to the beleaguered patient and the perplexed operator.

PATHOLOGIC FRACTURE OF MANDIBLE (OSTEOMYELITIS) FOLLOWING REMOVAL OF IMPACTED THIRD MOLAR

By Dr. Harry J. Field, Newark, N. J.

THE patient, a male about sixty years old, had an impacted mandibular right third molar removed on March 16, 1929. The impaction was of the vertical type, having partially erupted six months previously. The history further revealed an acute exacerbation from a pericoronal infection but is not definite as to whether the tooth was removed at the height of the attack or not. Fracture of the tooth occurred during removal. Bone reduction and elevation were used to complete extraction.

Postoperative healing progressed very slowly. In this connection it may be of interest to state that there was a history of several recent normal extractions followed by exuberant granulations and the throwing off of bone

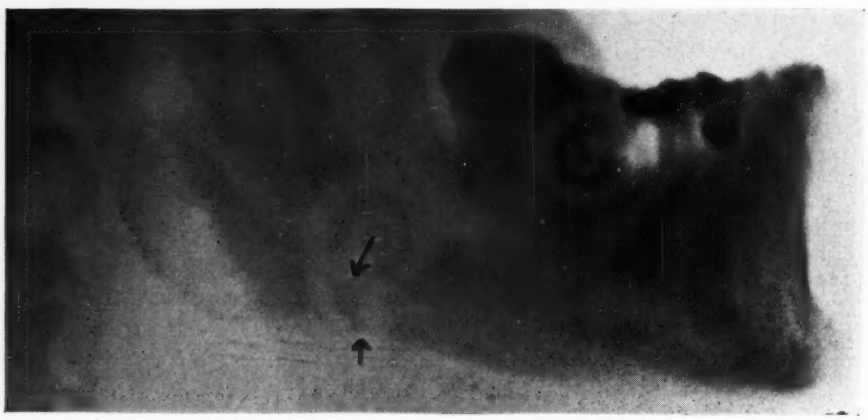

Fig. 1.—Roentgenogram showing sequestration at the lower border of the mandible, making the division between the ramus and body complete.

spicules before ultimate healing. Examination revealed no diabetes or other systemic disturbances.

On April 20, 1929, the patient was referred with a periostitis along the right side of the mandible. Intraorally a large surface of inflammatory granulations was noted, with subacute suppuration. Roentgen examination revealed a small border of bone still holding the ramus and the body intact, with several small sequestra within the bed of granulations. These sequestra were gently lifted away with a spoon curette, keeping away from the bone to avoid spreading the infection into healthy canaliculi. The area was dressed with iodoform after irrigating with Dakin solution. On April 22, the periostitis had somewhat subsided, although pain was developing in both temporomandibular joints. On April 29, the pain in the joints was more pronounced and roentgen studies showed further sequestration, making the division between the ramus and body complete (Fig. 1).

An orthodontist was called in to construct a retaining appliance for immobilization. In the maxilla only two teeth were available, the right lateral and second premolar. These were banded and connected with a bar, turned into a small loop at the labial aspect of each band. In the mandible the two cuspids were banded and joined as in the maxilla. Fortunately, the patient had been wearing a partial upper denture, which was placed before the inter-

Fig. 2.—Roentgenogram showing early bone regeneration and band of new tissue at the inferior border after ten weeks.

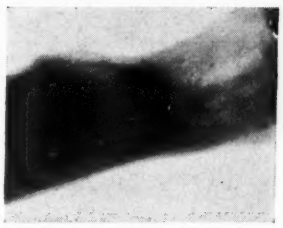

Fig. 3.—Intraoral film showing bone regeneration after four months.

maxillary wires were tied through the upper and lower loops in cross fashion. A Barton bandage was worn to support the mandible.

The area was dressed with iodoform three times a week. Exfoliation was spontaneous, the last sequestrum being extruded on June 29. Figs. 2 and 3 show the condition entirely healed, ten weeks after immobilization, with early bone regeneration. A band of new tissue is observed at the inferior border of the mandible. Slight numbness is experienced in the lip but this is gradually disappearing.

TEETH AND TRIGEMINAL NEURALGIA

By Prof. Dr. Med. Max Melchior, Copenhagen, Denmark

Translated by W. M. Reppeto, D.D.S., professor of Dental Pathology, Baylor University, College of Dentistry, Dallas, Texas

UNDER the term neuralgia one usually understands a pain which is noticed in a nerve or its distribution and which usually appears with painless intervals. Neuralgia is not a disease in itself but always a symptom which can influence the nerve in various ways. This conception was advanced in 1897 by Berhardt and later given especial attention by O. Bloch and others.

The causes of trigeminal neuralgia are extraordinarily manifold and various. It would lead too far afield to go into all of them, so I will discuss only the fact that those neuralgias caused by diseases of the dental apparatus play a greater rôle, because of the great occurrence and clinical significance, than is generally recognized. I will concern myself mainly with the dental neuralgias whose etiologic factors are concealed and difficult to recognize.

Partsch and after him Becker, Williger and Sydney Gross have brought to attention the fact that little slivers of bone after alveolar fracture and fractured root fragments can heal in the jaw and cause severe neuralgias a long time after extraction. Partsch reported several such cases in 1911 in which the dental cause was concealed and difficult to recognize but in which the neuralgias were similar to the so-called genuine neuralgia. One understands this latter condition as being a neuralgia in which one can show no specific causes; and for that reason one accepts the fact that it arises from, and until now unrecognized, disease in the nerve itself, thus a physiologic nerve disease, a true neurosis. (Trosseau, Krause, Hildebrandt, Becker, Williger and others.) As a differentiation from these genuine or true neuralgias Partsch gives to those emanating from dental causes the name neuralgiform pain, although they appear to be similar to genuine neuralgias and can be mistaken for such conditions. He gives no differential point between the two kinds of pain. This conception of neuralgiform pain (or pseudoneuralgia) has since then been considered as an expression (Becker, Misch, Williger, Euler and Kantorowicz) that those pains from the teeth are a type of neuralgia which has been spoken of very little and only simulates the true type, and also that various diagnostic signs have been evidenced by which it should be possible to differentiate between neuralgiform pains and true neuralgias. As the matter is of great clinical significance, I will consider here shortly the special diagnostic signs according to Misch, Troemner and Williger.

Misch says that the genuine neuralgia possesses some characteristics which are evidenced mostly in severe cases. The onset of pain is generally more frequent, it appears more unexpectedly and suddenly, and reaches the high point more quickly. The single phases are shorter, more pulling, the pain

*From Vierteljahrsschrift für Zahnheilkunde, 44. Jahrgang 1928, Heft 4.

curve rises sharply, its peak is sharp and the descent is also sharp. Furthermore, light pressure and psychical effects can cause the onsets, which often appear at definite times of the day. This does not occur in dental neuralgia. Its pain curve rises gradually and falls similarly; the apex is broader; the pulling, lightning type of pains are absent; the pain is set up by cold or heat which influence the teeth and is usually stronger at night when the patient has gone to bed.

Troemner, the neurologist, says that evident differences exist between the "vulgar tooth pain" and the genuine neuralgia. While the pain in the first-mentioned type is more lingering, dull, boring, persistent, localized in or around a tooth and there being an evident sensitiveness of the affected tooth to heat, cold, faradic current or to pressure, the latter condition being caused by the progression of a periodontitis, the true neuralgia exists as a violent, acute, boring, gnawing pain in the anatomic distribution of one or more branches of the nerve. The pains appear intermittently, crucially and paroxysmally, and are often accompanied by flowing of tears or by the tic char-

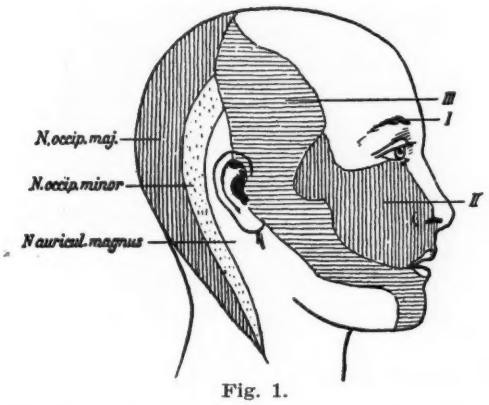

Fig. 1.

acteristic contraction of the muscles of the affected region, especially the zygomaticus and orbicularis oculi. Extraordinary sensitiveness to contact is often evident, especially to pressure, usually by the sign of Valleix at the openings of the foramina through which the nerves leave the bone.

We will consider Williger's idea, "The pain from genuine neuralgia appears characteristically paroxysmally and lightning like." They are produced often by external causes and in severe cases disturb the night's rest. In opposition to Troemner, he says that the recognized Valleixian pressure points are often not painful. As a differential point from the genuine neuralgic pain is advanced the conception that the pain from dental afflictions is sudden, if not lightning-like, but lasts for a longer time, sometimes even for hours. The pains often disturb the night's rest; this occurs only seldom in the genuine neuralgia.

The question is now, can the quoted diagnostic signs help to differentiate the diagnosis between dental neuralgia, alias "neuralgiform pain," and the genuine or true neuralgia? Can one, in other words, rely upon the fact that those pains produced by the teeth and the dental apparatus have a different and less impressive neuralgic character, for in the main the quoted variations

in the characteristics are only different grades of intensity and duration. One will surely understand that the answer to the question has an immense practical importance for the correct diagnosis and also treatment and prognosis, for it can become very serious in so far as the patient is concerned in the highest measure if one confuses the two types of neuralgia, makes first the diagnosis of genuine neuralgia and overlooks the eventful destructive processes in the teeth and their environment. The patient usually goes to the neurologist for treatment by the remedies at his disposal or he undergoes surgical treatment (neurectomy, alcoholic injection or resection of the Gasserian ganglion) which is merely a truly symptomatic means of treatment which can lead to improvement, but the patient will never be free from trouble. Over the life period of the patient from there on is suspended the same inscription as that above the entrance to Dante's hell, "You, who enter, leave all hope behind."

The clinical cases must answer the weighty question with the decisive words, and I will cite to you 11 cases of dental neuralgia where the etiology was concealed and the diagnosis was difficult.

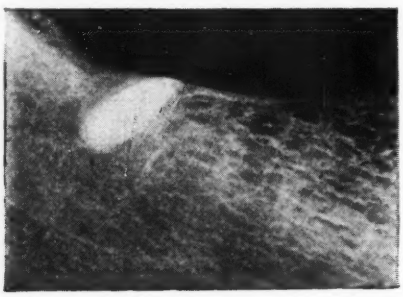

Fig. 2.

CASE 1.—Widow, 65 years old, Sept. 19, 1922, gave a history of extraction of all molars and bicuspids in the right side of the mandible; nineteen years later a severe neuralgia began in the right half of the face. Investigation showed the patient edentulous with a pain point in the right side of the mandible at a place where the x-ray showed a healed-in root fragment of the mandibular right first molar. Removal of the root and healing.

Because of toothache the patient had all the molars and bicuspids in the right side of the mandible extracted thirty-four years before. There was no more pain until fifteen years before when neuralgic pains began in the right side of the face but not in the teeth. In the beginning they appeared with intervals of one or two months and lasted only a day, later they occurred more often and in the night when they were especially severe. The pains came suddenly, many times by inhalation of air, were successive, appeared with severe onsets, began at the zygomatic bone and emanated from there partially toward the eye and partially toward the right angle of the mouth, many times to the temple and the right ear. If the onsets were especially severe, she noticed contractions in the right side of the face and the right cheek became red. Simultaneously the conjunctiva became red with a flow of tears, and there was an excessive secretion of mucus in the throat and from the right nasal passage.

Objective examination.—No teeth were evident in the maxilla, no signs of antrum or alveolar process disease, no Valleixian pain point, all the premolars and molars missing in the right side of the mandible. The alveolar process was somewhat atrophic, mucous membrane movable, of natural color, no fistula, no thickening or processes felt. On the lingual side of the alveolar process approximately in the area of the distal root of the mandibular right first molar was a little place which was painful to pressure and where heavy pressure caused an attack of pain. The x-ray showed here a remnant of a root which was completely surrounded by bone (Fig. 2). The rest of the examination showed nothing significant.

Sept. 24.—Under conduction anesthesia an incision was made on the alveolar crest with the formation of two soft tissue flaps which were loosened from the bone and raised laterally. Chiseling evidenced a root which was entirely healed in the jaw. It was removed with comparative ease, was bullet shaped and was imbedded in a small cavity with intact walls. The wound healed quickly. The pains were gradually lost over the course of about six weeks.

Postoperative examination, Dec. 20, 1923. The pains had completely vanished. The operation wound had healed, no type of sensitiveness or swelling. The x-ray showed nothing special.

CASE 2.—Man, 40 years old, January 23, 1923, gave a history of difficult extraction of all teeth six years before, later felt well, recently suffered from neuralgic pains in the left half of the face. There was external swelling of the maxilla. X-ray showed a healed-in root of the maxillary second molar. Removal of the root resulted in permanent disappearance of the pain.

Detailed report: The patient was of a healthy family and had suffered from no serious sicknesses. Six years before all the teeth, which were greatly carious and had caused him much pain, particularly the maxillary left second molar, were extracted. A bad condition accompanied by a rather severe hemorrhage on the first day followed the extraction, and he was confined to bed for a week. In the following two or three months many small pieces

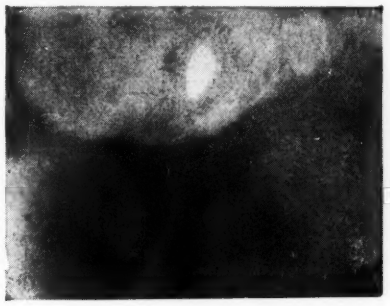

Fig. 3.

of bone worked out in both the maxilla and mandible. After that he felt well and wore dentures, but in the past week had intense neuralgic pains lasting for a day at a time, affecting the temporal and mandibular regions. Four days before examination the pains stopped again. He observed a swelling in the maxilla which disappeared simultaneously with the disappearance of the pain.

Objective examination.—The patient was edentulous. The alveolar process was atrophic. On the left side of the jaw there was over the first and second molar regions in the buccal sulcus a small, smooth, hard, slightly sensitive swelling covered with normal mucous membrane. There was no fistula, no pressure point to be observed, no glandular swelling in the neck. X-ray examination of the maxilla showed a healed-in root comparing to the previous position of the maxillary left second molar. Around this root was an obvious shadow which disappeared in the surrounding bone tissue (Fig. 3).

January 25.—Incision of the soft tissue was made at the mentioned area and resulted in successful removal of a root which laid directly under the external lamella. Curettement was done of the surrounding bone tissue, which was necrotic. Flabby granulation tissue was removed, and a cavity the size of a cherry remained. The wound healed after twelve days.

December 21.—The patient came for postoperative examination. He said that he had had no pains since the operation and was completely healthy. The operation wound was healed presenting a depression. No pressure sensitiveness or swelling to be evidenced. The x-ray showed nothing abnormal.

CASE 3.—Woman, 34 years old, January 13, 1925, gave a history of influenza six years before, during which a severe pain appeared in the left ear. From then on she suffered at

intervals from severe neuralgias which extended to the left side of the maxilla and the forehead. The treatment instituted by ear and nerve specialists was unsuccessful. It was brought out that the maxillary left third molar had been extracted twelve years before. Upon examination a pain point was found in this area, and the x-ray showed an imbedded root fragment near a fractured portion of the tuberosity. Both were removed surgically, and she has been free from pain since that time.

Detailed report.—During influenza six years before a severe pain appeared in the left ear. In the past years she has had severe pains lasting as long as eight days at a time, with painless intervals of from five to six weeks. They appeared as typical severe neuralgias spontaneously as well as from mental disturbance but not from heat or cold. They were lightning like and caused pulling pains in the left inner ear from which they were distributed to the left side of the maxilla and along the lower portion of the orbital cavity to the inner angle of the eye and followed the supraorbital nerve to the forehead. Meanwhile spasms also appeared in the left side of the face, and the pain ceased suddenly. She had felt all these years the sensation of pressure in the head which had been especially pronounced in the temporal region; patient was very despondent and tired of life.

She had been treated by general practitioners, nerve and ear specialists, and had been in clinics where she was given many various treatments. She was under treatment from an ear specialist all the past winter.

Close questioning brought out the fact that she had suffered from severe inflammatory pains in the maxillary left third molar twelve years before, for which reason a dentist extracted the tooth. The extraction was difficult and painful.

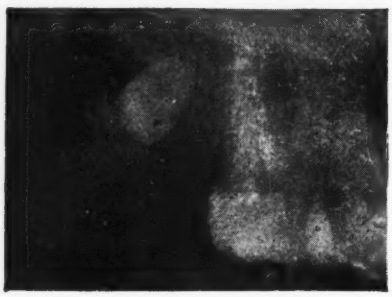

Fig. 4.

Objective examination.—The maxillary left third molar was missing from the mouth. The mucous membrane had a natural appearance in that region. No fistula or thickening of the alveolar process but on the buccal surface a very sensitive point where pressure produced a violent attack of pain. The x-ray showed an imbedded root stump. At the same time was noted behind the root a fragment of the jaw itself (Fig. 4). Examination of the ear showed nothing abnormal.

January 14.—Under conduction anesthesia, an incision was made in the soft tissue and the root fragment was removed. It was picket shaped with pericemental thickening. Then a loose sequestrum was removed, which was long and irregular and compared to the lower and most distal part of the maxillary tuberosity. The wound healed after two weeks.

March 7.—Patient reported no more pains in the ear, had slept well since the operation, had no pain or pressure in the head.

X-ray, March 17, showed a normal condition in the operative field.

Case 4.—Female, 20 years old, February 20, 1925, gave a history of having suffered for many years from extensive caries and toothache. The last teeth were extracted during the past two years and she had suffered for the past eight months from severe neuralgia on the left side of the face. Simultaneously a swelling appeared in the maxilla. Objectively there was a fistula and an external periostitis at the area of the maxillary right first bicuspid. The x-ray showed a sequestrum in this area. Removal of the sequestrum brought about complete healing.

Detailed report.—The patient had always had bad teeth which were extracted from time to time. About a year before, she suffered from toothache and swelling in the right side of the maxilla. The eight remaining maxillary teeth were extracted, and some weeks later, since the pain was still present, the last of the mandibular teeth were also extracted.

Since then she had suffered with severe intermittent pains which appeared during the day and sometimes lasted as long as a week. The pains appeared spontaneously, violently as a sudden pulling, began in the maxilla from where they extended to the angle of the eye and were particularly strong there. She had noticed contractions around the right eye and tear secretion and reddening of the cheek when the pain reached its high point. During the past week she had noticed pain and simultaneous swelling of the maxilla in the premolar region.

Objective findings.—The patient was edentulous; a fistula was present on the free margin of the alveolar process in the first bicuspid region on the right side above, through which an instrument could be passed into the empty alveolus, and here a somewhat rough body was felt. The external alveolar wall was thin and gave to pressure. Above the alveolus one could feel a hard, sensitive periosteal thickening, and the mucous membrane here was red and swollen. There was sensitivity at the infraorbital foramen. In the right submaxillary region there was an indolent swelling of the glands.

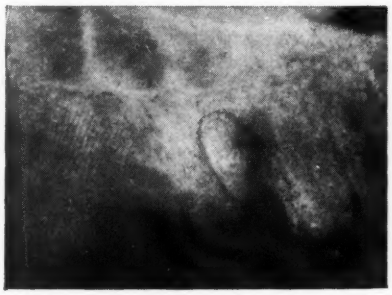

Fig. 5.

In the x-ray (Fig. 5) one sees a sequestrum in the region of the first bicuspid approximately the size of an orange seed. There was no root fragment.

February 22.—Incision was made of the soft tissue on the buccal surface, the sequestrum was removed, and the surrounding tissue was curetted. Recovery.

Case 5.—Male, 54 years old, March 10, 1925, gave a history of extraction of the maxillary right second molar six months before. Five weeks later neuralgias began emanating from the extraction area accompanied by spasms in the facial muscles and dryness of the mouth. There was a fistula on the alveolar process in the area of the distal root of the second molar. The x-ray showed a sequestrum, the removal of which brought about complete healing.

Detailed report.—The maxillary right second molar was extracted six months before. The patient was from a healthy family and had always enjoyed good health. Five weeks after the extraction the patient developed continuous increasing pains which appeared in short lightning-like attacks arising from the extraction wound and ending in the temple; both areas were very sensitive. The pain appeared spontaneously and from cold as many as twenty times a day but never in the night. During the attack the patient noticed "vigorous sensations in the cheek," externally he had short periods of muscular spasms so that he had bitten himself on the tongue and cheek. Dryness of the mouth also existed during the attack. The painless intervals lasted from some days to two weeks. Medical treatment was unsuccessful.

Upon objective examination a fistulous opening was found on the free margin of the alveolar process in the area of the distal root of the maxillary right second molar, and upon passing a sound into the depth of it a hard rough bone was struck which gave rise to a

severe attack of pain. There was rather extreme sensitiveness at the area corresponding to the root apex and likewise at the infraorbital foramen. The x-ray (Fig. 6) showed a sequestrum at the area of the second molar and in the sensitive area.

March 12.—Incision was made with the formation of a four-cornered opening. An irregular sequestrum the size of a pea was removed. Wound was sutured and packed with iodoform gauze.

March 30.—The wound was healed. The patient was completely well. Postoperative examination on Dec. 12, 1926, the patient had been fully free from pain since the operation.

Case 6.—Male, 30 years old, April 4, 1924, gave a history of extraction of all remaining teeth nine years before, maxillary and mandibular, felt well for three years, but shortly afterward neuralgias appeared arising from the left side of the maxilla and extending widely. Behind the maxillary left first bicuspid was a misplaced healed-in bone fragment, after the removal of which the pain vanished completely.

Detailed report.—Nine years before the patient had all the teeth in the maxilla and mandible extracted under narcosis. He felt well for about three years, since then he had, with intervals of various durations, suffered pains, which came suddenly and in a shooting manner, and he had been sensitive in the left side of the maxilla and had external pains toward the eye and the mandible. The pains appeared mostly from the chewing of hard substances and the inhalation of cold air.

Fig. 6.

Examination revealed the roots of the maxillary left first bicuspid, the mandibular left first bicuspid and second molar present. They were sensitive to palpation and finger pressure. Distally to the maxillary first bicuspid, could be felt a small, bony, hard, sharp margin which was drawn up about one centimeter from the free margin and was somewhat larger at the top. The mucous membrane here was healthy and stretched and very sensitive. Pressure in this area produced an immediate neuralgic attack.

Under conduction anesthesia the root of the maxillary left first bicuspid was removed, and then an incision was made in the mucous membrane in the area of the second bicuspid. Here was found a small bone fragment which was rotated about 90 degrees on its axis so that its sharp margin projected buccally under the mucous membrane. With forceps and ronguers the bone fragment and the adjacent alveolar margin were removed.

The wound healed rapidly, and upon later examination the patient was found to be completely free from pain.

Case 7.—Female, 30 years old, March 23, 1925, gave a history of removal of the maxillary right first bicuspid and filling of the cuspid, violent neuralgias for eight months in the region of the major occipital nerve. During the attacks she had spasms in the neck muscles. Upon examination a fistula was found which led toward the root apex of the cuspid. X-ray examination showed a granuloma here along with a tooth remnant (odontoma) in the area of the first bicuspid. After removal of the cuspid and odontoma the pains stopped.

Detailed report.—The patient suffered from syphilis ten years before, for which reason she was treated for a long time with ointment. Later no relapse. Gradually almost all her teeth had been extracted. One year before the maxillary right first bicuspid was removed

and the maxillary right cuspid filled with synthetic. In the past eight months she had suffered with violent neuralgias in the neck which followed the course of the major occipital nerve and radiated to the back of the head. Her head was drawn backwards and to the right, and a severe hyperesthesia of the skin of the neck existed. Contact (washing, combing the hair or rubbing) brought out pains which began suddenly in severe typical attacks and lasted as long as twelve successive days with long intervals of no pain following. She noticed a fistula herself which formed in the region of the bicuspid and that when this opened the pains stopped, which reoccured when the fistula closed.

She had been treated twice in the hospital but with only temporary improvement.

Objective examination.—The root area of the maxillary right first bicuspid showed in the buccal sulcus a light periosteal thickening which was not sensitive. Slightly distal, about one centimeter above the free margin of the alveolar process there was a fistulous opening which led mesially and upward toward the root of the cuspid. This tooth was somewhat discolored, not sensitive to percussion or pressure, had been filled and did not react to the faradic current. The alveolus of the bicuspid had closed, and the soft tissue was normal there. The x-ray shows a granuloma on the root of the cuspid and a dim diffuse shadow in the surrounding bone tissue. In the area of the bicuspid is seen a little oval tooth remnant closed in the jaw (Fig. 7).

There were no signs of syphilis or evidence of disease of the cervical vertebrae, the ear or throat. Wassermann test was negative.

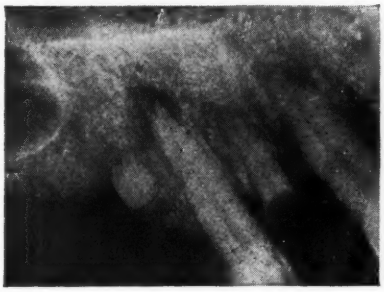

Fig. 7.

The cuspid which had the granuloma on the root was extracted. Toward the sulcus the bone was destroyed and mushy, and was curetted thoroughly.

Incision of the soft tissue was made over the area of the first bicuspid. After removal of the external bony wall there was evident a long small odontoma on the superior surface, which was quite irregular. It was easily removed and the cavity was sutured and packed with iodoform gauze. Twelve days after the operation the wound was healed. The patient felt very well upon examination and was very much relieved.

Check-up examination, March 5, 1928, there had been no more pain since the operation, no swelling or sensitivity to pressure at the operative area.

CASE 8.—Female, 49 years old, January 29, 1925, gave a history of having suffered for three months with intense neuralgic ear pains with auditory hyperesthesia. Extraction six years before of the mandibular right first bicuspid at which time a root fragment was left which upon examination was almost completely covered by soft tissue. The x-ray showed a granuloma on the root with an osteitis in the surrounding bone. After extraction and curettement, cessation of symptoms took place.

Detailed report.—Patient had suffered intense pain in the right ear without any recognized etiology, which distressed her immensely for three months. The pain came almost daily, and recently she had repeatedly been awakened from her sleep. The pain attacks came quickly, were painful to the ear, were violent, of short duration and ceased quickly. Now and then violent pains were accompanied by an onset of intense auditory hyperesthesia and progressed in intensity and frequency. She had been repeatedly treated by an ear specialist without success.

Upon closer questioning the patient divulged the fact that the mandibular right first bicuspid was supposed to have been extracted six years before, but she had noticed six months later a little root stump in the area and that this had become somewhat sensitive at monthly intervals.

Upon examination it was evident that the root of the mandibular first bicuspid was present and almost completely covered by soft tissue. Some sensitivity was evident upon percussion and finger pressure in the apical direction. Below the root there was, on the buccal side of the jaw, a bean-sized, hard, flat thickening of the periosteum, and the mucous membrane was somewhat hyperemic here. The examination of the ear showed some redness and swelling of the anterior wall but nothing else abnormal. In the retromaxillary region one could feel a pea-sized glandular swelling.

The x-ray showed a granuloma on the root of the bicuspid with a diffuse shadow in the surrounding bone tissue. Many teeth were missing and some were filled, but otherwise there was nothing pathologic evidenced in the teeth or jaw. The above-mentioned root with the granuloma was extracted. The wall of the alveolus felt soft and decayed to pressure with an instrument, so it was removed with a sharp curette. All softened bone and granulomatous tissue were removed.

After fourteen days the wound was healed. Patient has been completely well since then and has had no more ear pains. Postoperative examination was held on December 16, 1926.

Case 9.—Male, 77 years old, December 13, 1923, gave a history that the last teeth had been extracted eight months before and for six months he had pains of a shooting nature which extended widely, beginning in the mandible on the right of the median line. An exostosis was found in the mandibular right lateral region which upon pressure gave rise to an attack of pain. The exostosis was removed; healing followed.

Detailed report.—The teeth began to loosen twenty years before and had gradually fallen out or been extracted, the last having been removed eight months before. He had worn prosthetic appliances a long time. In the past six months he had, upon masticating, violent shooting pains in the area of the mandibular right lateral which seemed to him "as though there is a needle which sticks." From there the pains extended toward the maxilla and toward the lateral side of the right eye. The attacks were of short duration and ceased quickly but were very distressing. He had noticed spasms in the cheek and eyelid simultaneously with the pains.

Upon objective investigation the patient was edentulous, the alveolar process greatly atrophied, the mucous membrane normal. In the median part of the mandible the alveolar process was irregular, comb-like and projecting somewhat to the right of the midline. Approximately in the area of the lateral incisor was a process harder than bone, the size of a hemp seed, under the mucous membrane, which was somewhat thinned out and sensitive. Upon strong pressure in this region a violent attack of pain appeared. There was no pain point on the rest of the jaw or on the face. In the x-ray (Fig. 8) was evident a little bony process, like a mountain peak, on the margin of the alveolar process with a buccal inclination.

Under conduction anesthesia an incision was made along the entire projecting part of the bone; the soft tissue was loosened buccally and lingually. The quite irregular thin projecting portion of the alveolar process was removed with a chisel, likewise the above-mentioned little prominence which showed up as a hard pointed mass and was situated in the lateral area with a broad base. The bone tissue was very hard in this particular area. The flaps were sutured. Primary healing and cessation of pain followed.

Case 10.—Widow, 68 years old, September 15, 1921, gave a history of extraction of all remaining teeth which were very carious, seven years before. During the past two years she had suffered from neuralgias of the right half of the mouth and face with no recognizable etiology. The pains gradually grew worse. Medical and surgical treatment were unsuccessful. The resection of an ivory hard part of the alveolar process brought rapid improvement.

Detailed report.—As it was necessary seven years before for her to have dentures, all remaining teeth were extracted, since they were extensively carious, partially loose and had

caused intense pain for a long time. She herself had noticed that in several teeth there were "little red tubercles." After the extraction she felt well until two years ago when she began to suffer intense, shooting pains in the right side of the face and the mouth from no obvious causes. The pains appeared suddenly in severe attacks, began in the premolar region of the mandible, extended along the inferior alveolar nerve to the ear, were also very noticeable in the maxilla, in the right side of the tongue and lower lip. During the attack there were spastic movements in the right half of the face, which felt as though it were swollen. The pains came spontaneously, independently most of the time, but in the last months her sleep had been disturbed.

She had undergone various treatments with all kinds of medicines, painting with iodine and three alcohol injections without permanent improvement. As she suffered great distress, she finally sought surgical aid.

The patient was edentulous; the jaws were atrophic. The mucous membrane of the various parts of the mouth was normal. On the right side of the mandible in the second bicuspid area was a very painful area the size of a pea. The mucous membrane in this area was movable and normal. The x-ray showed no root remnant here or anything which could be called pathologic with certainty in this part of the jaw. There was a pain point on the face at the mental foramen. There was no adenopathy.

September 29.—The above-mentioned area was incised, and inner and outer flaps were formed. The buccal surface of the jaw was denuded over quite an area. It was possible to see then that the bone in the second bicuspid region was white and ivory-like. The entire

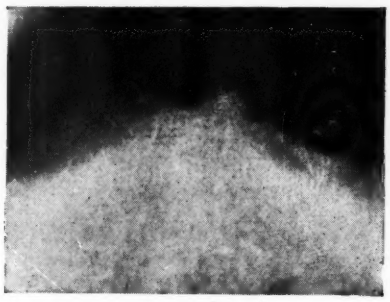

Fig. 8.

compact part of the bone was removed with a chisel. This part of the operation was difficult, as the bone was extraordinarily intact and hard. The flaps were sutured.

The wound healed without reaction. On February 12 she was last seen. She had quick pulling pains now and then in the premolar region but no more at night. The pains had certainly lessened as to intensity and frequency and did not cover such a large area. The wound was covered with healthy tissue, and there was no more local sensitivity.

CASE 11.—M. N., 65 years old, former nurse, March 24, 1927, gave a history that for two years she had suffered with intense neuralgic pains. All teeth had been extracted, the last twenty-two years before. In the lateral right mandibular incisor region there was a sharp bony projection evident under the mucous membrane. After its removal the neuralgia ceased.

Detailed report.—The patient came to the clinic because of facial pains on the right side which had begun two and a half years before but had been extremely severe the past year. They appeared every day and had recently disturbed her sleep. The pains came suddenly without any evident cause in the right cheek, severely shooting, in the maxilla and mandible but were not like a toothache. During the attacks she noticed spasms in the face along with excessive lacrimal and salivary secretion. She could neither speak nor swallow with ease and had to keep her hand on her cheek constantly. The pains were usually of short duration and stopped suddenly, whereupon she felt entirely well. She has been under professional treatment many times without any success.

It was brought out that twenty-five years before most of her teeth were extracted and some years later the remaining ones. She had dentures made then and had worn them since that time.

Objective examination.—She was completely edentulous, the jaws were greatly atrophic and the mucous membrane normal everywhere. In the mandibular right lateral region one could feel a short projecting thin bone which was covered with thin mucous membrane. The area was sensitive to pressure. The x-ray showed a slightly radiolucent bony projection, while the rest of the areas of the jaws showed nothing abnormal. She had no Valleixian pressure point in the face, and no head zones were evident. She had some arteriosclerosis.

An incision was made over the projection with flap formation, and the entire bony projection, which was thin and knife sharp, was removed. After careful smoothing of the bone the wound was sutured.

Wound healed by first intention; the pains ceased completely.

Check-up examination Nov. 15, 1927, there was no sensitive point at the area of the previous operation. She wore dentures without difficulty. The facial pains had vanished.

These cases are instructive from several angles. They were always severe, mostly obstinate, long enduring neuralgias which appeared with the same pains which should characterize them as true (genuine or idiopathic) neuralgias. We find here the "unexpected and sudden" in onset (Misch) in Cases 1, 6, 8, 9, 10, 11, and the lightning type (Misch and Williger) in Cases 3 and 4; we find that the pain curve rises to its height steeply and that the pains were of rather short duration (Cases 8, 9, 11), very violent, drawing and sticking (Cases 3, 9, 10), that they appear from external causes such as chewing, pressure, washing, cold air, etc. When Troemner says that the pains in genuine neuralgia have crises and appear in paroxysms accompanied by excessive lacrimal secretion or that there are "externally characteristic" types of tic convulsions in the affected muscular region, they compare in the majority with my cases. Several times vasomotor disturbances were observed during the attacks in which the face became red and hot as though it were swollen (Cases 1, 4, 10), likewise secretory disturbances as excessive lacrimal (Cases 1, 4, 11), excessive mucous secretion in the throat and nasal cavity (Case 1), or lessened salivary secretion with dryness on one side of the mouth, all disturbances which are typical of genuine neuralgia as described by Nothnagel, Bernhardt, Krause, Carl Lange and others.

In all the cases which I have considered above the neuralgias, as far as one could ascertain, which were diagnosed as genuine neuralgias, a peripheral dental cause was evident upon thorough examination. It is important to observe that these causes were often small and insignificant: a root fragment, a sequestrum, a small root granuloma, a small local thickening of the alveolar process, a little bone projection, or an insignificant exostosis. It is certain in all events that trigeminal neuralgia may be caused by an extraordinarily insignificant factor, likewise that a stimulus of the finest dental nerves is sufficient to cause the most violent pains. It is important for the dentist to be familiar with these facts.

After the removal of the dental cause, healing succeeded, even though the neuralgia had been present a long time, from some weeks or months (Cases 2, 5, 7, 8, 9) to a year (Case 4), two to six years (Cases 3, 6, 10, 11) and even in one case (Case 1) for fifteen years. I have not been able to observe some of my patients for sufficient time, as they were mainly polyclinic material, and so often those patients go away as soon as they are well or have been improved. But in most cases I have been able, through check-up examinations, to substantiate lasting improvement.

Various lengths of time after operation were necessary for the entire loss of pain, which has also been called attention to by Partsch. It is quite natural that the pain does not disappear immediately if it has been present for many years. Those which produce intense stimulation in the nerve which may have perhaps caused fine anatomic changes must have time before disappearance. As a rule the pains ceased very quickly after operation, especially the night pains, or there was great improvement. The prognosis must therefore be thought of as favorable even when the neuralgia has existed for a long time. Troemner and Kron also make mention of this. Misch says that in early cases the prognosis is good, for a rational dental treatment will bring healing, but in old cases "the most careful treatment of the teeth brings about no noteworthy lasting success even if the appearances of the etiology point to the teeth." Adams cites as so-called focal infection a case of neuralgia which had been caused by an extraction twenty years before in which a root was fractured and became imbedded in the jaw. Four days after the removal of the root the neuralgia disappeared.

In all cases it was evidenced that extraction had taken place previously to the neuralgia, and in most cases the etiologic connection was not to be doubted. Often the extractions had been done many years before: six years in 3 cases (Cases 2, 10, 13), nine years in one case (Case 6), twelve years in (Case 3, and in Cases 9, 11, 1) twenty, twenty-two and thirty-four years had elapsed. No wonder that the patient often did not think any more of the extraction, and it is understandable that the fact would be overlooked or forgotten upon examination. This must be considered always in doubtful cases after an extraction and investigated and not underestimated in its importance even when the extraction has been done long before. The late consequences of tooth extraction are recognized too infrequently; they are hardly spoken of in the best textbooks, and yet these afflictions are of great importance. I have previously called attention to the "bone inflammations as consequences of tooth extraction" (1925), and we now see that in the cited cases the necessity of considering the various forms of neuralgia from this angle.

Another particular circumstance must be made notice of. There was often a long painless interval between the extraction and the neuralgia, from months (Cases 5, 8, 9) to many years (Cases 2, 3, 6), even in 2 cases nineteen and twenty years respectively. These long painless intervals indicate that after the extraction pathologic changes were in existence or latent and must have slowly reached a certain extension or intensity before the neuralgia was finally produced. In agreement with this, after a root was left, a deformed degenerative pericemental thickening was found (Cases 1, 3) by which pressure was possibly caused on the fine nerve fibers, or various inflammatory changes in the bony tissue of the alveolus, sclerotic osteitis as described by Grosz (Case 10), exostosis (Case 9) or rarefying osteitis in the region of the root (Case 2) or granulomas (Cases 7, 8). Likewise it is clear that sequestra (Cases 4, 5) or irregular bone projections after extraction (Cases 6, 9) can cause pressure neuralgias as Partsch has pointed out, and he teaches that in extensive extractions the removal of bone projections and the interalveolar septa and suturing will obviate this condition.

Furthermore we see that a severe neuralgia in the depth of the ear, neuralgia tympanica, can be caused by disease in the maxilla (Case 3) and also by a granuloma on a mandibular bicuspid (Case 8).

Case 7 is interesting, in which the patient suffered from an occipital neuralgia caused by a granuloma of a bicuspid. A similar case has been described by Williger. There is nothing remarkable about this. There are many observations in literature about the connection between the dental system and reflex neuralgias, not only in the trigeminal region but also in other nerves, such as the facial, glossopharyngeal, vagus, optic and acoustic. In Case 8 an unquestionable hyperesthesia acoustica existed.

From the above it is seen that even though the neuralgia does not take place in the teeth or dental system, one should not rule out the possibility of a dental cause.

We have now seen that dental neuralgias can simulate other neuralgias and that one can neither by the character of the pain itself nor by its localization differentiate it from the so-called "genuine or true" neuralgias. The quoted variations are very often present, but dental neuralgias can be as severe as other neuralgias. They can even appear in the most severe forms which are similar to the forms of tic douloureux described by Trousseau which he calls "neuralgia epileptiform," where because it is understood that in an external neuralgia of unknown cause the pain attacks appear in succession or after intermissions of weeks, are very sudden and especially severe, but as a rule last a very short time, not more than a few minutes. We have also seen among my cases instances of these forms which the other French authors describe as the grand facial neuralgia, whose cause is concealed and whose weightiest diagnostic sign is the long duration, frequency, obstinacy and resistance toward every type of treatment.

In considering everything the familiar naming of dental neuralgia as neuralgiform is incorrect. Instead of "neuralgiform facial pains" for those neuralgias produced by the dental system, one should in the future use the more exact and descriptive term "dental or odontogenous neuralgias."

But how shall one recognize a dental etiology in cases not clear, which appear with the picture of genuine neuralgia, and make a correct diagnosis?

Here is the only way to proceed, the examination alone is decisive. This investigation must proceed with every aid being used, and not only the teeth but also the jaws and neighboring tissues as well must be studied.

One should first examine the teeth carefully with an explorer and mirror and of course always look for hidden approximal cavities, and one should not, as Dieck has especially indicated, think that teeth which appear externally as intact cannot be the cause. In this connection the faradic current will be found a great help in ascertaining the condition of the pulp, and I would like to call attention to the use of the absolutely necessary x-ray pictures in diagnosing denticles, new formations on the roots, retained teeth, cysts and other conditions. Misch calls attention correctly to this fact as follows "that radiography has dispelled the idea of many a picture of idiopathic neuralgia."

But it is not sufficient to investigate the teeth; one must in doubtful cases always undertake an exact examination of the jaws and especially in those places where previous extractions have taken place, which fact is especially important. Even if the soft tissues are natural, one can find the causes of neuralgia here, as my cases show so clearly. One must observe every little thickening of the bone, small processes of local sensitivity, as has been especially noted by O. Bloch and Partsch; but especially it is of greater meaning if one finds a sensitive spot on the alveolar process from which pressure will cause an attack of pain. In such a case one can conceive correctly that at this place there is something pathologically evident and will often find the hidden cause here (Cases 1, 3, 5, 9, 10). External examination of the jaw is not sufficient. It should be supplemented by the x-ray which shows the distinctive clearing up of the condition within the jaw, surrounding latent or imbedded root fragments, odontomes, alveolar fractures, sequestra, granulomas and cysts and furthermore the sclerotic changes in the alveolus, tumors and foreign bodies, all conditions which otherwise would not be evident and are often the specific causes of neuralgia. Where large areas of the jaw are edentulous, one must as a rule gradually investigate them. Moreover, little jagged edentulous areas and little softenings need not always be definitely pathologic.

Generally one will reach this goal by a definite, searching examination of the jaws and is very often astonished to find hidden disease processes of whose existence one did not have the slightest suspicion. However, one finds some cases in practice where it is not difficult to see a local disease which could not only be the emanating point of a neuralgia but also clarify where the pain is mainly situated. Especially in neuralgias which have existed for a long time it is of the greatest importance to find out which branch of the trigeminus is primarily involved, but it may be very difficult to do so (Krause, O. Bloch). It is not unusual that the patient who has suffered for years from pain cannot even say where the exact position of the pain is—"in the whole head" or "in the face," etc., is all one can find out. In such cases one must (O. Bloch, Dieck) study the patient to observe where the pain begins, where the most sensitive area is, where it extends to and where it stops, likewise what causes an attack, contact, mastication, etc.; everything about which only the patient himself can give information is of importance in making the diagnosis.

Otherwise it will not be clear whether the pain follows definite anatomic nerve channels; exact facts can help in a great measure to find the situation and starting point of the neuralgias. Indeed this is an examination which surely claims the patience of the diagnostician and the patient.

Likewise it is important to authenticate Valleixian pressure points which are present in facial neuralgias often but not always (Romberg, Schuh, Hasse, Eulenberg, Erb, Seeligmueller, Bernhardt, Krause, Bloch); indeed they are not always at the points described by Valleix, mainly at the infraorbital and mental foramina but also are found in other places. I consider it of greater importance to locate definitely a hyperesthetic point on the jaw for the diagnosis of an odontogenous neuralgia, as I have quoted above.

To make the examination complete I wish to bring attention to the necessity of examining the nose, accessory sinuses, the ears, the eyes and the adja-

cent structures which may be primarily the seat of the neuralgia which may be reflected to the trigeminal region. It is also self-evident that one must know the many other causes of trigeminal neuralgias, and close cooperation between the dentist and a competent specialist is of noteworthy interest to both parties.

In every case experience has taught, as I have brought out in the cited cases, that one must be careful in making a diagnosis of genuine or idiopathic neuralgia before one is quite certain from the examination that a peripheral dental cause can be ruled out. I have learned after long years of experience that the majority of trigeminal neuralgias are in close relationship in one or more ways with the dental apparatus, and I have an opinion opposite that of B. Krause and Bernhardt, who lay little weight on the relationship of the teeth, and that of the neurologist Troemner, who declares that diseases of the teeth "certainly are of no great importance" in the development of the neuralgia. An American dentist, Silverman, believes that no dental diseases, no matter of what nature, have ever caused a trigeminal neuralgia, which is an entirely erroneous conception. The experienced clinician, O. Bloch, says correctly, "that the causes of trigeminal neuralgia especially can often be ascribed to peripheral diseases—above all things those which have a relationship with the teeth and alveolar process." Also Reinmoeller says that trigeminal neuralgias arise for the most part from dental diseases; likewise Sidney Grosz writes that "the majority of trigeminal neuralgias are of local origin and that the local causes are very often not disclosed or removed."

If one makes a rule to make a careful examination of the teeth and jaws in every case of trigeminal neuralgia, the field of the genuine neuralgias will become ever smaller.

SUMMARY

1. Dental neuralgias, the so-called neuralgiform facial pains, pseudo- or false neuralgias, can appear with exactly the same characteristics as the genuine or true neuralgias. The two types of neuralgias are often confused, to the great injury of the patient.

2. In the majority of cases, the so-called genuine (true, idiopathic) neuralgias show upon closer examination a peripheral cause which is most often found in the dental system.

3. Dental neuralgias can originate from teeth which have been removed long before. The extraction can give causes in various ways to the development of pathologic changes within the jaws which can give rise to neuralgias many years later.

4. Dental neuralgias need not appear in the trigeminal region but can show up in other nerves in exceptional cases.

5. The diagnosis of dental neuralgias can often be especially difficult and necessitates the most careful examination not only of the teeth but also the jaws. One must in doubtful cases always take x-rays, especially of edentulous areas of the alveolar process.

6. The prognosis is good if the dental cause is found, as its removal can lead to complete health, even though it has existed for many years.

DEPARTMENT OF
DENTAL AND ORAL RADIOGRAPHY

Edited By
Clarence O. Simpson, M.D., D.D.S., F.A.C.D.,
and Howard R. Raper, D.D.S., F.A.C.D.

EXTRAORAL RADIODONTIC EXAMINATIONS

By Dr. Clarence O. Simpson, St. Louis, Mo.

(Continued from November issue.)

THE application of the term "lateral jaw pictures" to extraoral examinations has created the impression that only side views of the face were useful in oral diagnosis. To the contrary, views in or near the sagittal plane often are indispensable. For examination of the incisor regions, to avoid superimposition of the cervical vertebrae the head must be inclined both backward and toward the side being examined, the position of the casette and the angle of projection being the same as for other extraoral examinations. The view obtained by this pose extends from the first bicuspids to the opposite lateral incisors. By inclining the head toward the opposite side, a corresponding view of the teeth on that side can be obtained. The curve of the dental arches and the superimposition of the vertebrae make it necessary to examine the incisor regions extraorally from each side. The principal indications for these views are suspected fractures or misplaced teeth in these regions. Anteroposterior views in the sagittal plane are obtained by pressing the nose and chin against the casette with the sagittal plane vertical and laterally perpendicular to the casette.

This view is indicated for localization of misplaced teeth in or near the maxillary sinuses and broken syringe needles, and observing fractures of the mandible between the condyle and bicuspid regions on both sides. Emphasis should be given to this method of examination in discovery or exclusion of mandibular fractures. An injury to the mandible indicates a radiographic examination of the entire bone because of the tendency to multiple fractures. Six extraoral views are required to inspect the mandible carefully for fracture unless the anteroposterior view is obtained. The one view in the sagittal plane will reveal a fracture with displacement in any part of the bone, excepting the anterior segment which is obscured by the vertebrae, and is far superior to others for inspection of the rami and condyloid processes.

The target-film distance must be longer for extraoral than intraoral views to produce sharp definition with the films farther from the teeth and bones

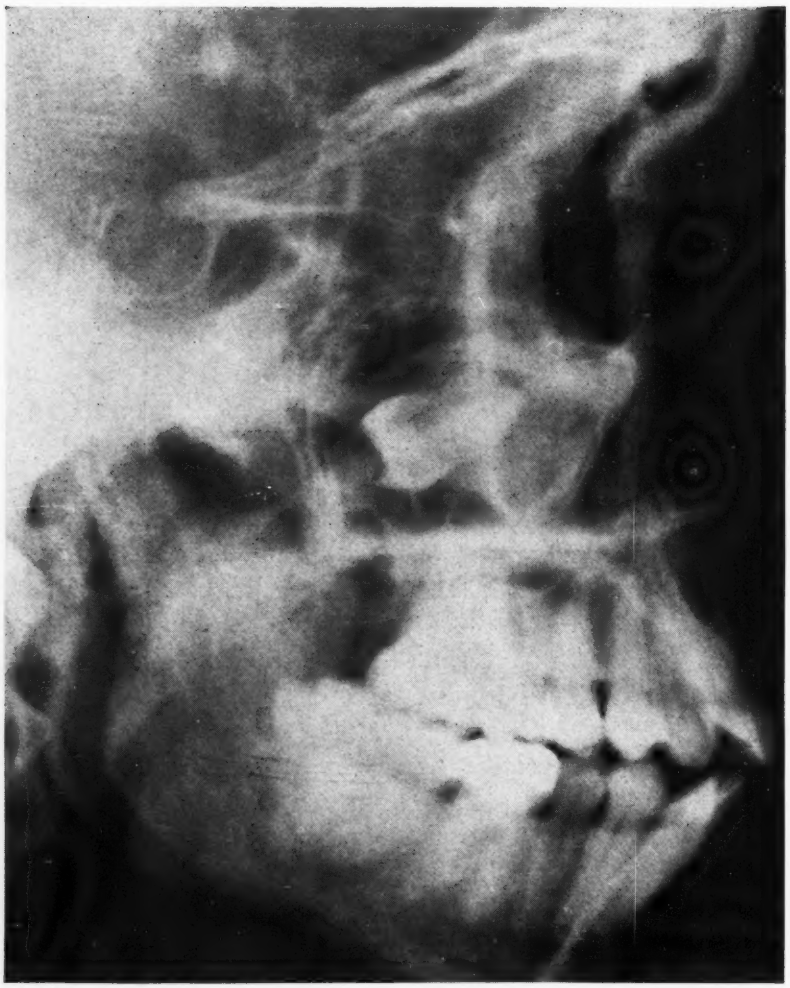

Fig. 16.—A profile extraoral view for the localization of a maxillary third molar which was lost during an attempt to remove it. The ordinary lateral view with the face inclined toward the casette is misleading in localization near the sagittal plane because of the diagonal projection. With the sagittal plane parallel with the casette and the central rays directed at the malar process and perpendicular to the casette, the malar process and maxillary sinuses of both sides are superimposed and the anteroposterior and superoinferior location of an object in this region is revealed.

Fig. 17.—An anteroposterior view to complete the localization of the displaced third molar shown in Fig. 16. The combination of the two views reveals the third molar located in the maxillary sinus.

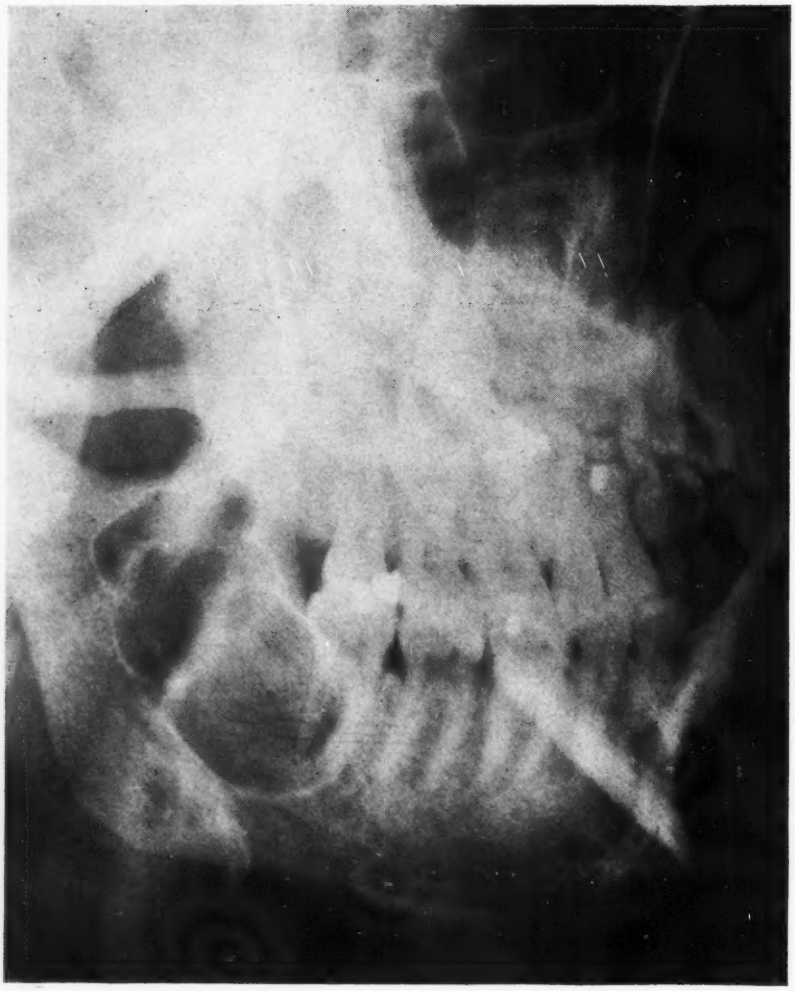

Fig. 18.—A lateral view of a multiple cyst extending from the mandibular third molar to the sigmoid notch. An anteroposterior view is indicated to disclose the buccolingual outlines of the cyst.

Fig. 19.—An anteroposterior extraoral view revealing the buccolingual outlines of the cyst shown in Fig. 18. The internal surface of the ramus is almost destroyed, but the external surface is intact which could not be determined by the lateral view.

Fig. 20.—An ordinary extraoral view to disclose the region explored with a probe through a suppurating sinus opening on the face. The information obtained was inadequate until supplemented by that of an anteroposterior view.

and to improve the perspective of a more extensive area. Even with the dental x-ray machines a distance of thirty inches can be used, and with two intensifying screens the exposure time will be only about five seconds unless the neck is superimposed. Views in the sagittal plane require about three times as much exposure, depending upon the size of the neck which must be penetrated. The instructions of the manufacturers to place the cone or cylinder near the face for extraoral examinations are incorrect because of the distortion which this method produces. The short-range extraoral views suggest the renowned weapon

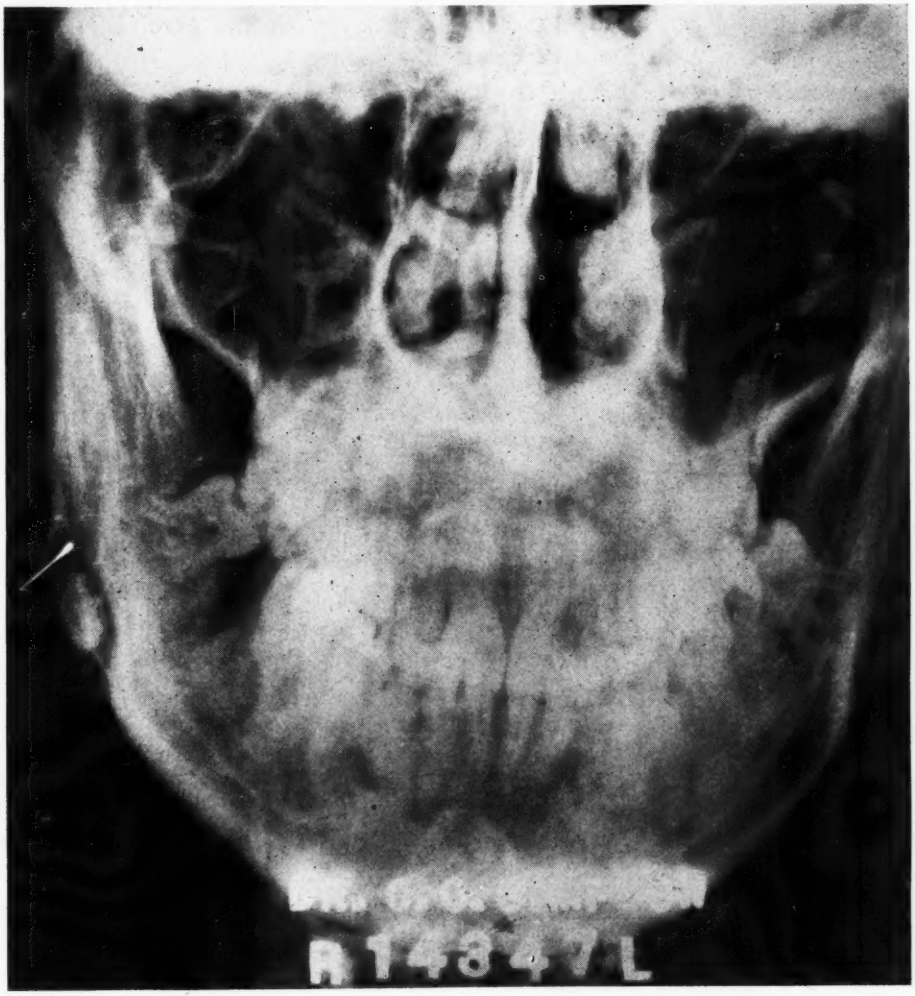

Fig. 21.—An anteroposterior view of the region explored with a probe in Fig. 20. This view reveals a sequestrum at the angle of the mandible which was not clearly shown but can now be traced in the lateral view.

with which Sampson slew the Philistines rather than human jaws, and when the occiput is included, the image resembles that of an anthropoid ape.

To accurately center and direct the central rays the light reflected from the filament through a small opening in the end of the cone may be utilized, or an extension attachment may be fitted to a cylinder to measure the distance and center the rays. The point at which the central rays should be directed for all examinations excepting in the sagittal plane is just below the angle of

the mandible nearer the tube. For views in the sagittal plane, the central rays should be directed just below the occipital protuberance. Modifications in technic are necessary for some special examinations. The inspection of the submaxillary region for displaced teeth, calculus, or foreign bodies is best accomplished by a verticohorizontal angle of ten degrees below horizontal to avoid projecting them onto the mandible. For the localization of objects in the walls or cavities of the maxillary sinus, the lateral examination should be made with the sagittal plane parallel with the casette, the angle of projection perpendicular to the casette, and the central rays directed at the malar process. For anteroposterior views in the sagittal plane with the casette inclined ten degrees toward the neck for a comfortable pose, the verticohorizontal angle of projection will be ten to fifteen degrees below horizontal depending upon the profile.

Less exposure and penetration are required for the bones of the face than those of the head, and this must be considered in operating and development. The density to be judged in the development of extraoral views is that of the region under examination and not that of the cranial bones. The mandibular portion of the negatives should be developed a little beyond the desired density and chemically reduced to obtain more detail in the other portions. The radiolucent zone of the pharynx especially indicates reduction, with care to avoid streaks in this confusing area. Since there are no means of distinguishing the front or back or double coated films and the view cannot always be identified by the teeth, lead letters should be attached to the casette with adhesive tape to mark the right and left sides. By placing the latters facing the casette, they will appear correctly when the images are viewed toward the patient. Radiographs should be viewed through the back of the films to obtain the normal perspective because the images are registered on the front, and the objects nearer the film will appear nearer. Anteroposterior view is appropriately descriptive of the images seen when the film is placed before the face and the rays are directed through the back of the head.

The interpretation of extraoral views is rendered difficult by the lack of sharp definition and the superimposition of the images. An endeavor has been made in the illustrations and legends to direct attention to the landmarks which should be observed and some of the probable errors of interpretation. In all branches of radiography, interpretation becomes easier and more accurate as care and skill are exercised in the examinations.

A CONVENIENT X-RAY SCREEN

By Albert Wynn, D.D.S., New York, N. Y.

IN THE July, 1928, *Dental Cosmos,* an article by Eugene P. Pendergrass, M.D., pointed out some of the dangers to which dental x-ray machine operators are exposed. Other investigators before and since have called our attention to that fact.

Several of my colleagues and myself placed x-ray films with coins attached, in our vest pockets for two weeks. At the end of that period, our films when developed, with one exception, showed a definite outline of the coin.

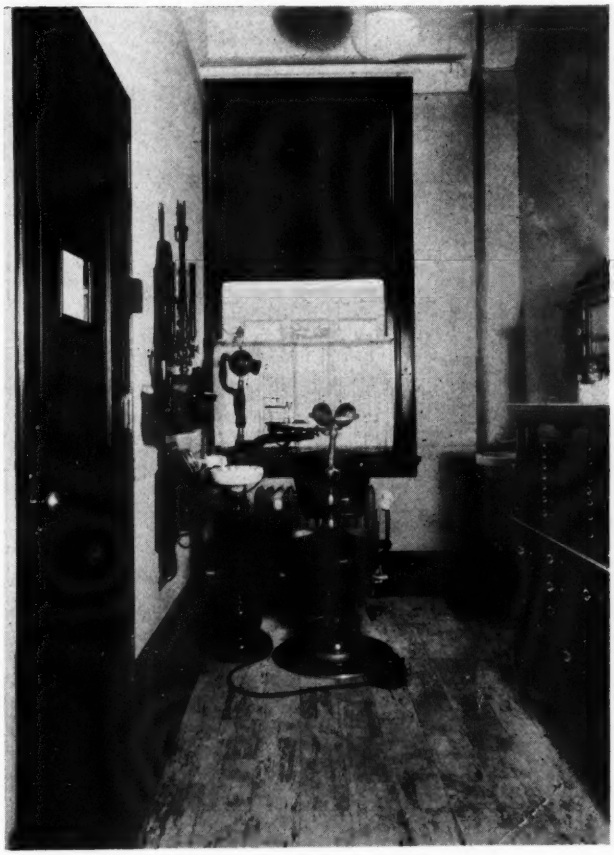

Fig. 1.

One of my colleagues thereupon purchased a protective lead screen on casters and again placed a film with a coin attached in his vest pocket and another film likewise prepared on the protected side of the screen. At the end of two weeks, both films were developed and no sign of the coin could be seen.

As time went on, however, my friend told me that he used the screen for

a full series of films but did not bother using it for taking a single film as it was too troublesome to move about.

A few months ago when I moved into a new suite, I drew my plans so as to enable me to utilize a door for the screen. I managed to bring the time-controller to the protected side of the door in a manner making it impossible to take even a single film without getting behind the screen.

In the upper panel of the door leading from the operating room into the laboratory, I inserted a piece of lead glass, 8 by 10 inches, at a height permitting a clear vision of the patient in the chair. Then on the laboratory side of the door I fastened a sheet of lead, $\frac{1}{32}$ of an inch in thickness, 30 inches wide, and six feet high, with an opening for the lead glass window.

Fig. 2.

A hole was bored through the wall directly in back of the board upon which the x-ray machine is mounted. The cord of the time-controller was then brought through to the laboratory side of the wall and thence carried along the wall and hung on a hook fixed on the leaded side of the door.

Where there is no door, the board supporting the x-ray machine may be extended toward the rear of the chair to simulate a door and the screen made as described above.

To test the worth of the screen, a film with a coin attached was properly adjusted on it, and another film likewise prepared in my vest pocket. After two weeks both films were developed; there was no sign of the coin.

ABSTRACT OF CURRENT LITERATURE

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA
DENTAL RADIOGRAPHY
By Dr. Edward Preble, New York City

NUTRITION AND PEDIATRICS
By Samuel Adams Cohen, M.D., New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Nutrition and Pediatrics

The Effect of Ultraviolet Light on the Blood of Newborn Infants. Heyworth N. Stanford. Am. J. Dis. Child. **37**: June, 1929.

In a previous article the author observed that the ultraviolet light was capable of increasing the blood platelets in the newborn infant. In this paper Sanford states his findings on a series of 120 newborn infants, studied during a period of ten months. Among his conclusions is one to the effect that a short exposure to the ultraviolet light increases the total white cell count to a slight extent, the lymphocytes being increased at the expense of the polymorphonuclear lymphocytes. These changes, however, are of short duration, for the blood picture rapidly returns to normal.

The Effect of Ultraviolet Rays in Experimental Rickets With Studies on the Lime Depositing Capacity of the Light. Carl Sonne. Arch. Physical Therapy **10**: 138, 1929.

Reporting from the Finsen Light Institute, Copenhagen, Denmark, the author tells of some important experiments with ultraviolet rays. Sonne makes the striking statement that he noted in all previous experiments with rats and light which were reported by other observers that these rats ate or rather licked off the grease of their skins on the hair (which contains much ergosterol) and in this way received by mouth the influence of activated grease of the skin (the hair on the skin being previously activated by light baths directed on the skin). He therefore performed light-bath experiments on depilated rats which were completely freed of all hair growing on their backs, and he so arranged them in hoods that they could not possibly draw their heads through to get at the rest of their bodies. With a second group of rats held in hoods he allowed the hair to remain on their backs. As a

result of these observations he proved that the ultraviolet rays act directly through the skin. He therefore feels that the action of the light bath on human rickets actually is due to the action of the rays on substances within the skin.

It is interesting to state that he noticed that the lime depositing capacity of the light is dependent on the quantity of energy irradiated. Sonne found, moreover, that the ultraviolet irradiation causes a deposit of lime both in the rachitic and in the osteoporotic bones. Because of the positive findings in his experiments, Sonne believes that ultraviolet irradiation should be tried wherever there are disturbances in the mineral metabolism.

The Effects of Ultraviolet Rays on the Capillary Blood in Active Rickets. Abraham S. Small. New England J. Med. **200**: 484, 1929.

Small found practically no beneficial effect on the anemia associated with rickets healed with ultraviolet rays.

Working in the Children's Hospital, Boston, this investigator for three years observed the effects of ultraviolet rays on the capillary blood in a group of fourteen infants with active rickets. In a well-written article he summarizes his carefully controlled observations by stating that exposure of infants with active rickets fails to reveal any outstanding changes in the capillary blood when they are exposed over a period of time to various types of ultraviolet transmitting glasses such as quartz, corning, Vitaglass, Celloglass, as well as the Alpine Lamp.

The Transmission of Ultraviolet Light Through the Human Skin. Albert Bachem and Jacob Kunz. Arch. Physical Therapy **10**: 50, 1929.

These authors review the literature on the study of the absorption of ultraviolet light by human skin. They state that not only is it difficult to come to a conclusion about the quantitative and qualitative distribution of the light in the tissue but they also are unable to determine where the various components of the spectrum influence the organism to produce biologic effects.

In this article the authors offer a preliminary report of their own investigations regarding ultraviolet light. Among other things they state that various layers of the skin exert a very different absorption and show characteristic selective absorption bands. Moreover, they feel that the ultraviolet and even the far ultraviolet parts of the spectrum penetrate deeper and stronger than is commonly accepted.

Syphilis and Pregnancy. S. A. Gammeltoft. Am. J. Syph. **13**: 194, 1929.

The material of the article is based on Professor Gammeltoft's observations of 1290 syphilitic women, 5.5 per cent of the women who were delivered in the Lying-In Hospital of the University Clinic of Copenhagen, Denmark, from 1912 to 1926. He takes up and answers a number of practical questions regarding syphilis and pregnancy. His material has fully confirmed the view that the *maternal transplacentary transmission is the only way of transmission, or practically the only way of importance.* (Author's italics.)

From the author's tabulations of treated and untreated cases of syphilis in pregnancy, he easily confirms the findings of other authorities in demonstrating the great superiority of salvarsan combined with mercury treatment during the term of pregnancy in order to safeguard the health of the offspring. If the best results are to be obtained for both mother and child, this authority states that every syphilitic mother should be treated during pregnancy with salvarsan and mercury or bismuth. *They should be treated without any regard to the date of their initial infection, and certainly with no regard to any previous intensive treatment, and finally, they should be treated without any regard to a negative Wassermann reaction.* (Reviewer's italics.)

The author expresses himself very clearly in answer to some perplexing questions: first, as to whether an infant born of a syphilitic mother is syphilitic, and second, if there are no visible manifestations of syphilis, should the child be treated for syphilis. In numerous instances when the mother gives a positive Wassermann reaction and her child gives a negative Wassermann reaction and does not show any clinical sign of syphilis, he is unable to say for certain that this child has syphilis. This type of child receives no treatment, but he watches it carefully. He never treats it unless it shows clinical signs of syphilis or gives a positive Wassermann reaction.

The Hutchinson Triad and Disturbances of the Endocrine. A. Cange and Renee Antoine. Gaz. d. hôp. **101**: 76, 1928.

These authors make some pertinent remarks regarding the Hutchinson triad, particularly with reference to the teeth. They quote Cedercrentz, who stated that because the spirochetes have a special affinity for the parenchyma, disturbances of the endocrine glands follow which lead to tissue changes in the teeth and probably in the eye and labyrinthus. During the period of septicemia resulting from infection, the presence of spirochetes has been noted in all the tissues and in all organs. Nocheles, Massia and Dupasquier are a few of the authorities who have reported the finding of spirochetes in the tooth structures.

The authors feel that more explanation is necessary to account for the maxillary central incisors being involved exclusively. They quote Langer and Wassmun, who show that there is an arrest in the development of the intermaxillary bone during fetal life which may be due to a gumma of this bone. Even this explanation seems unsatisfactory. The authors, therefore, feel that because of the peculiar sensitiveness of the thyroid gland and the thymus gland to the spirochete, in congenital syphilis it seems more logical to look to the endocrines for an answer for the peculiarities of the maxillary incisors.

They mention the work of Fleischmand and Krantz, who, experimenting on rats, excised the hypophysis glands and the parathyroid glands. These investigators noted severe dental changes, although there was no evidence of the Hutchinson triad. Krantz also cut out the thyroid gland in rabbits and hogs, and in a great majority of these cases found that there was a diminution in size and disturbances in the formation of the dentine and the enamel.

Congenital Syphilis of the Thyroid Gland. William C. Menninger. Am. J. Syph. **13**: 164, 1929.

There are many conflicting opinions regarding the close association between congenital syphilis and disturbed endocrine function. There are, however, some authorities who feel that congenital syphilis is responsible for disturbances of the thyroid gland's activities.

In regard to hypothyroidism in congenital syphilis, the author states that this occurs relatively frequently, and evidence in most instances indicates that it is due to a toxin produced in the mother's uterus. Most likely the pathogenesis is an actual destruction of the thyroid gland tissue and an overgrowth of connective tissue. A great majority of these cases show clinical signs of thyroid undersecretion at an early age. Clinically there have been very few cases of cretinism and comparatively few outstanding cases of myxedema observed. It should be noted, however, that there are various degrees of hyposecretion of the thyroid gland, and perhaps for this reason, thyroid therapy has been widely advocated in congenital syphilis even in the absence of any particular evidence of thyroid disaster.

The number of cases of hyperthyroidism on a congenital syphilitic basis is much less than hypothyroidism. Pathologically speaking, there is a tendency to gumma formation in the thyroid gland. Microscopically the gland usually shows a perivascular connective tissue of varying degrees, which causes a compression of the follicles. Although the clinical evidence of hyperthyroidism does not usually manifest itself until postadolescence, there is a case reported of a congenital syphilitic child, who, at four years of age, had a profuse swelling of thyroid region. When he was five and a half years old, this child presented a typical picture of Basedow's disease. Autopsy findings revealed a gumma of both the right and left lobes of the thyroid.

Comparison of the Kahn Precipitation Test and the Wasserman Complement-Fixation Test in Syphilis. Theodore Thjötta and A. Schytte Blix. Am. J. Syph. **13**: 283, 1929.

Reporting from the bacteriologic laboratory of the Norwegian Army, at Osle, Norway, these writers tell of their experiences with the Kahn precipitation test, and the Wassermann complement-fixation test. During one year, 1638 such tests were performed at their laboratory.

Among their conclusions are that the Kahn test is more sensitive than the Wassermann test in treated cases of syphilis. In actual manifestation of syphilis, the two tests yield about the same percentages of positives. They feel that the two tests should be done simultaneously with the same blood specimen in order to arrive at the most reliable answer to the patient's clinical status.

Mercuric Salicylate. A Study of Its Excretion in the Treatment of Syphilis. H. N. Cole, John Gammel, Nora E. Schreiber, and Torald Sollmann. Arch. Dermat. & Syph. **19**: 105, 1929.

After reviewing the literature regarding the administration and retention of mercury salicylate in cases of syphilis, these Cleveland investigators tell of

their own study at the School of Medicine of the Western Reserve University. They state that it appears doubtful whether in the treatment of patients with syphilis, mercuric salicylate should be injected oftener than once a week. Their investigation showed that even after one or two weeks following the termination of a course of four or five injections of salicylate of mercury, over half of this amount is still retained. They therefore feel that harm is apt to result if these injections are given more often.

The Malaria Treatment in Congenital Syphilis. Karl Kundratitz. Therap. d. Gegenw. **70**: 61, 1929.

In the author's experience, there are any number of congenital luetic cases which are resistant to antiluetic treatment and other forms of therapy. He feels that these children would benefit by the so-called malaria treatment. Four special indications for this treatment are mentioned by the author:

1. Lesions in the central nervous system.

2. Patient with positive spinal fluid without symptoms.

3. Patient's exhibiting late manifestations of the disease which have not responded satisfactorily to antiluetic treatment.

4. Patient's having a positive blood serum reaction which does not change in spite of intensive therapeutic treatment.

The author describes the treatment which he states is given without danger to the patient. He advocates that from 3 to 5 c.c. of blood be taken from a malarial patient and injected into the child subcutaneously or intramuscularly. Chills and fever from 39° to 41° C. usually follow from nine to fourteen days. After eight or ten attacks of chills and fever the younger patients are given three grains and the older children seven and one-half grains of quinine twice a day for three days. The administration of quinine stops their attacks. After the malarial treatment salvarsan may also be administered. The age of the youngest patient was three years.

If a child has organic heart disease, nonsyphilitic nephritis, active tuberculosis or marked anemia, Kundratitz does not advocate this form of therapy.

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EDITORIALS

Some Facts Concerning The National Board of Dental Examiners

FOR a number of years the members of the dental profession have repeatedly asked why a National Board of Dental Examiners, with the power to grant certificates to qualifying dentists enabling them to practice in any state, has not been organized. The principal obstacle to a National Board of Dental Examiners is the dental examining boards of various states as represented by the National Association of Dental Examiners.

The National Association of Dental Examiners is a body supposed to be made up of members of various state boards. This association has been in existence a number of years, how long we do not know. During the entire time of organization it has never come any nearer to the adoption of a plan whereby a national license to practice dentistry can be issued than when it first started. In fact each state board seems to be jealous of its own authority.

For a number of years the medical profession has had a National Board of Medical Examiners, whose certificate is now recognized in about three-fourths of the states. There is also a National Board of Pharmacy which has been recognized almost nationally. Practitioners of dentistry are still forced to submit to an examination by each state in which they desire to practice.

Dr. Banzhaf during his term as president of the American Dental Association outlined a plan for the formation of an American Board of Dental Examiners, which was modified by Dr. Volland during his term as president and was adopted by the American Dental Association at its meeting in Minneapolis in 1928. At the last meeting in Washington there seemed to be considerable misunderstanding regarding the National Board of Dental Examiners. From a discussion which took place in the House of Delegates one would gather that very few members of the House of Delegates ever studied the plan for the formation and function of the National Board of Dental Examiners as worked out during Dr. Volland's administration.

Believing that a great many of our readers are unfamiliar with the exact plan and purpose of this Board, we are publishing the plan of organization in full which is taken from the by-laws of the American Dental Association, Chapter XI, Section XV.

"a. The National Board of Dental Examiners shall consist of fifteen members to be nominated by the Board of Trustees and elected by the House of Delegates. In addition to the fifteen elected members the Surgeons General of the Army, the Navy and the Public Health Service shall be ex-officio members of the Board.

"b. The fifteen elected members of the National Board of Dental Examiners shall consist of three groups:

"1. Active members of State Dental Board of Examiners who are members of the American Dental Association.

"2. Active members in recognized dental college faculties of professorial rank who are members of the American Dental Association.

"3. Active members of the American Dental Association who are not affiliated with a dental examining board or a dental college. The first Board shall be formed by the nomination and election of five members from each group. One member of each group shall serve respectively one, two, three, four and five years and thereafter three members shall be elected annually. In subsequent elections of members to the board, at no time shall either the examiner group or the college group be permitted to have more than five members on the Board. At no time shall there be more than one member of a state board of dental examiners of any one state or more than one member from any one dental faculty on the Board of National Dental Examiners.

"When a member of the Board shall cease to be a member of the group from which he was elected, his membership on the Board shall terminate at the time following the next annual meeting of the American Dental Association when his successor shall be elected to fill the unexpired term.

"c. The purposes and duties of the National Board of Dental examiners shall be to provide for the admission of qualified persons to the practice of dentistry in any state, territory or dependency of the United States without further examination by licensing boards thereof, except as required by the laws of various states. The National Board of Dental Examiners shall make such rules and regulations as may be necessary for the granting of a license as the Board may see fit, subject to the approval of the House of Delegates.

"d. The Board shall organize, elect a chairman, a secretary and executive committee and shall adopt such regulations for the government of its actions not inconsistent with these by-laws as it may deem expedient from time to time.

"The executive committee shall be composed of the chairman, the secretary and three other members of the Board, and shall, when the Board is not in session or has not specially provided otherwise, have general control and supervision of the Board's affairs and activities.

"The chairman and secretary shall be elected from members of the Board who are not affiliated with the teaching group and shall perform such duties as usually devolve upon such officers. The secretary shall keep a continuous record of the proceedings of the Board and shall submit for the Board an approved comprehensive annual report to the Board of Trustees and the House of Delegates of the American Dental Association. The Board may from time to time create within itself other committees under secretaries and directors to carry out and direct certain lines of work under its jurisdiction when the need and expedience shall arise.

"e. The Board shall meet yearly at the time and place of the annual session of the American Dental Association and at such other time as shall be designated by its executive committee.

"Not later than July 1 the National Board of Dental Examiners through its Secretary shall furnish in writing to the Secretary of the American Dental Association a detailed budget containing the estimated expenses and expenditures of the Board in order to carry out its prescribed duties during the ensuing fiscal year of this Association.

"All expenditures from and appropriations authorized by the Board of Trustees and approved by the House of Delegates for the National Board of Dental Examiners, shall be made in accordance with the plans, rules and regulations governing like expenditures for officers, committees and commissions as are now or may be established by the Board of Trustees subject to approval of the House of Delegates."

It can be seen from the above plan that the National Board of Dental Examiners is composed of three groups selected from members of the American Dental Association, members of the State Dental Board of Examiners and members of college faculties. The wisdom of having five members from the college faculties is questioned by some. The objection to faculty members is due to their being placed in the position of examining their own products, namely, their students. We know of no other enterprise, be it even commercial, where those who manufacture and construct an article are permitted to

determine its efficiency. We believe it would have been much fairer and more logical to have examiners who have more to do with dental administrative problems than with dental education.

However, the plan of organization allows five members of the college faculty to be on the National Board of Dental Examiners. The members of the House of Delegates think this a courtesy which the college faculties should appreciate. The dental schools contribute nothing toward the support of the National Board of Dental Examiners, and yet they are given one third of the representation. It seems to an uninterested party that dental colleges should be satisfied with the present plan as long as they are given one-third representation without their having to contribute financially. We find, however, that some members of certain dental faculties suggest that the representatives on the National Board of Dental Examiners should be appointed by the American Association of Dental Schools without the consent or aid of the American Dental Association. We also find that some members on the National Board of Dental Examiners are inclined to take the same attitude that the Dental School Faculties take in this matter.

It is the belief of the majority of the men who were instrumental in forming the National Board of Dental Examiners that as long as this Board calls upon the American Dental Association for financial support, the American Dental Association should have a voice in naming the members of the National Board of Dental Examiners. It is our belief that the present plan of organization of the National Board of Dental Examiners will prove of great benefit to the dental profession as a whole, providing the National Association of Dental Examiners, which is composed of the dental boards of the various states, realizes that the dental profession and the public are more important than certain members of certain state boards. If the National Board of Dental Examiners is not a success, no one will be responsible for the failure so much as the National Association of Dental Examiners and the National Association of Dental Schools.

The American Dental Association is willing to finance the National Board of Dental Examiners, but the members of the American Dental Association believe that as long as they are furnishing the money for the support of this Board, they should be allowed to pass upon its personnel.

In Memoriam

CHARLES AUGUSTUS HAWLEY, D.D.S.

CHARLES AUGUSTUS HAWLEY, a former president of the American Society of Orthodontists, died at Garfield Hospital, Washington, D. C., on July 22, 1929, of complications following an operation. His age was 68.

Funeral services were held on Thursday afternoon, July 25, at All Souls Unitarian Church in Washington. Burial was in Rock Creek Cemetery.

Dr. Hawley was born at Milan, Ohio, March 13, 1861, son of Noah M. and Abigail (Mowry) Hawley. He studied for three years at Ohio State University, and was graduated with the degree of D.D.S. at the University of Michigan in 1893. At the dental school he was president of his class and editor of the *Dental Journal*. After practicing for eight months in his native town, he removed to Columbus, Ohio, remaining there until 1910 when he settled in Washington, D. C.

Dr. Hawley began to specialize in orthodontia in 1904, and from that time his practice was limited to that branch of dental science, achieving in it an international reputation. Among his principal contributions to the literature of dentistry and of orthodontia were the following: "The Cohesion of Gold" (1903); "Relief From Pain in Orthodontia" (1904); "The Determination of the Normal Arch and Its Application to Orthodontia" (1904); "An Accurate Method in Orthodontia" (1906); "The Function of the Teeth in the Development of the Face" (1910); "A Study of Maxillary Movement" (1912); "The Problem of Teaching Orthodontia in the Dental School" (1914); "The Use of the Plain Band for Molar Teeth" (1916); "A Removable Retainer" (1919); "The Problem of Retention" (1920); "The Postoperative Treatment of Class II" (1921); "The Principles and Art of Retention" (1923); "Use of the Round Wire Preliminary to Adjusting the Ribbon Arch" (1924); "Orthodontic Photography" (1925); "The Value of Gnathostatic Models" (1925); "Treatment of Class II, or Disto-Occlusion" (1929). Among his valuable contributions to the profession were: a system of geometrical charts for predetermining the dental arch before treatment; an appliance for maintaining the position of the teeth after corrective measures have been completed, known as the Hawley removable retainer; a gold annealer and various instruments.

Dr. Hawley was a fellow of the American College of Dentists and a member of the American Society of Orthodontists (president, 1908); Southern Society of Orthodontists (president, 1929); New York Society of Orthodontists (president, 1929); Eastern Association of Graduates of the Angle School of Orthodontia (president, 1918); Dental Society of the District of Columbia (president, 1920); and the Delta Sigma Delta Fraternity. He was a Scottish Rite Mason (32nd degree) and a member of the University Club and Congressional Country Club of Washington; and the Croatan Club of Virginia. His

religious affiliation was with All Souls Unitarian Church. Dr. Hawley was alert to the community's demands upon his time and was constantly engaged in various movements of public welfare. During his régime as president of the Examining Board of the District of Columbia, he was instrumental in having a bill passed by Act of Congress prohibiting the display of misleading advertising signs calculated to or likely to deceive or defraud the public. The elimination of these signs from the District of Columbia was a valuable part in the program of beautifying the city of Washington. In the World War he served on a number of boards and committees engaged in war work.

For those who enjoyed the privilege of an acquaintance with Dr. Hawley he possessed a personal charm which was the expression of a kindly and generous nature. He will long be remembered as a benignant and dignified personality. His contributions to the upbuilding of his profession were notable and widely recognized and placed him in a position of lasting influence.

A widow, Mrs. Evelyn S. Hawley, national chairman of the ways and means committee of the League of American Pen Women; a daughter, Miss Carlotta Hawley, and a son, Archibald Hawley, all of Washington, survive him; also two sisters, the Misses Atty S., and Louise A. Hawley, both of Milan, Ohio.

—*F. T. M.*

ORTHODONTIC NEWS AND NOTES

Dental Society of the State of New York

The Dental Society of the State of New York will hold its Sixty-second Annual Meeting May 13, 14, 15, and 16, 1930, at Hotel Commodore, New York City.

A cordial invitation is extended to all ethical dentists, residents in the United States and Canada. Exhibitors desiring space please address Dr. T. C. Swift, 1 Park Avenue, Mt. Vernon, New York. Please apply early for information and space.

The usual preliminary program will be issued in January, 1930, and the official program in April, 1930. For further information address the Secretary, A. P. Burkhart, 57 E. Genesee Street, Auburn, N. Y.

The Eastern Association of Graduates of the Angle School of Orthodontia

A regular meeting of the Eastern Association of Graduates of the Angle School of Orthodontia will be held at the Vanderbilt Hotel, New York City, on Monday, January 27, 1930.

The annual meeting will be held in New York City, Monday and Tuesday, May 5 and 6, 1930.

E. Santley Butler, Secretary,
576 Fifth Avenue, New York City.

Dallas Mid-Winter Dental Clinic

The Dallas Mid-Winter Dental Clinic will be held February 10-12, 1930, in Dallas. The clinicians for this meeting are Dr. George M. Hollenback, of Los Angeles, crown and bridge work; Dr. R. O. Schlosser, of Chicago, prosthetics; Dr. Thomas P. Hinman, of Atlanta, surgery; and Dr. W. J. Charters, of Des Moines, periodontia.

Dr. Brooks Bell, Jr., Secretary,
1810 Medical Arts Building,
Dallas, Texas

Notes of Interest

Dr. Alexander Sved of 21 East 82nd Street, New York, wishes to announce the opening of a part time office at 9 Prospect Avenue West, Slote Building, Mount Vernon, New York. Practice limited to orthodontia.

Dr. J. H. Weaver announces the removal of his office from 608 Medical Arts Building to 1216-17 Medical Arts Building, Houston, Texas. Practice limited to orthodontia.

Dr. J. Conrad Watkins, Dr. David W. Holcomb, and Dr. J. Fred Hall announce the removal of their offices to Reynolds Office Building, Winston-Salem, North Carolina.

Dr. Percy Norman Williams announces the removal of his office to Speedway at Second Avenue, Tucson, Arizona. Practice limited to orthodontia.

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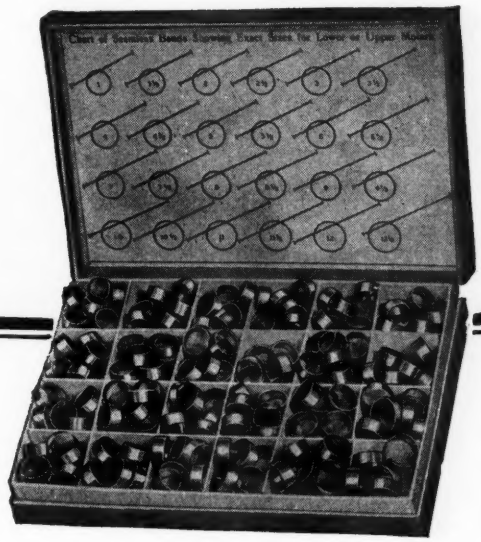

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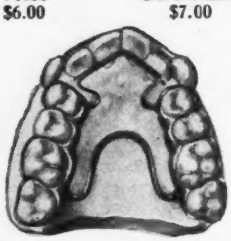

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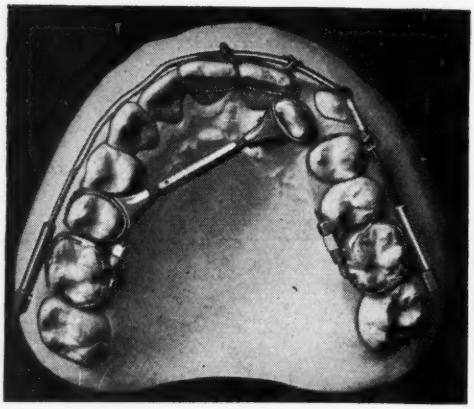

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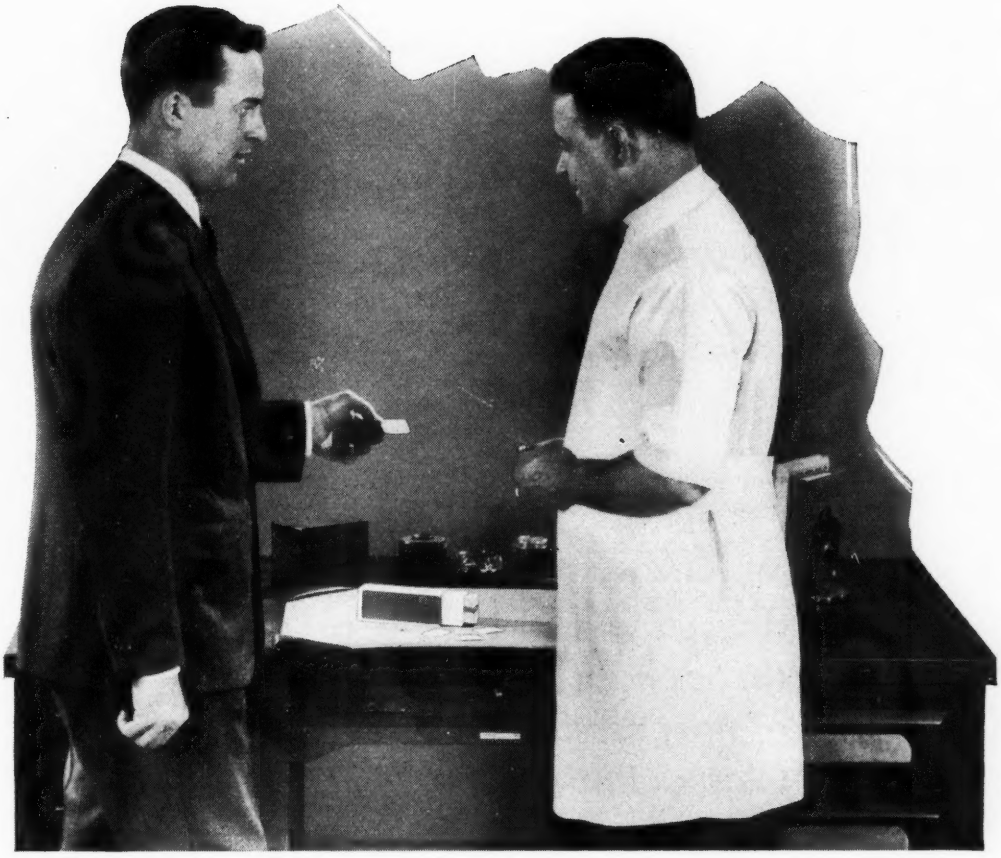

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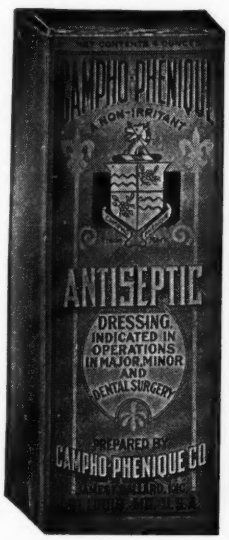

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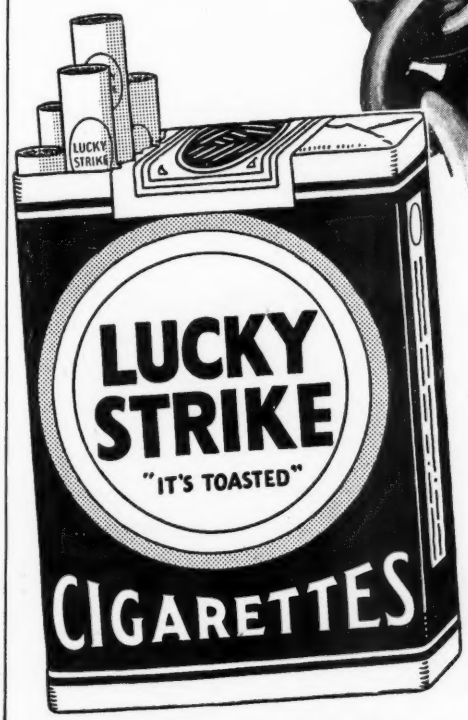

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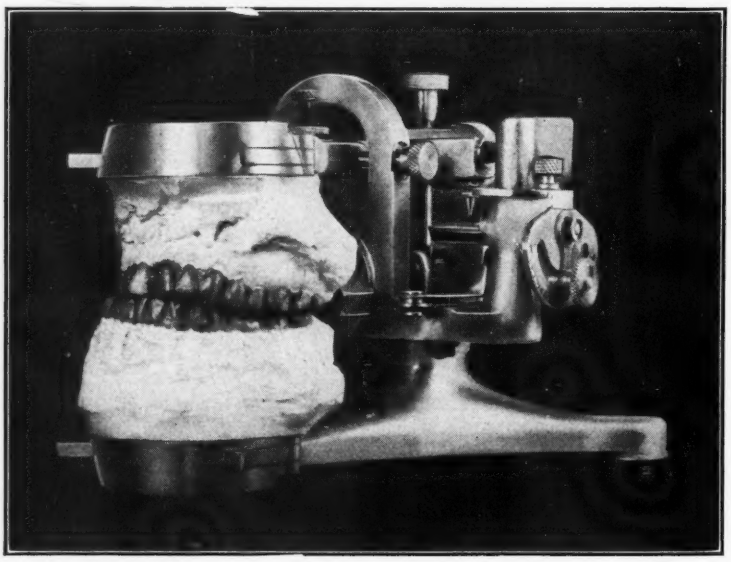

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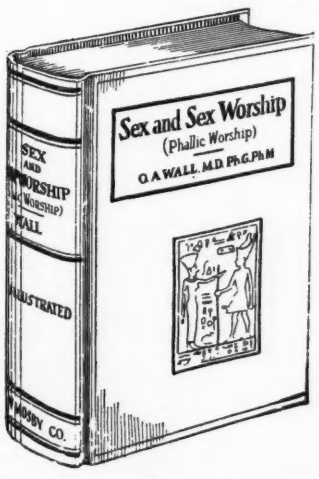

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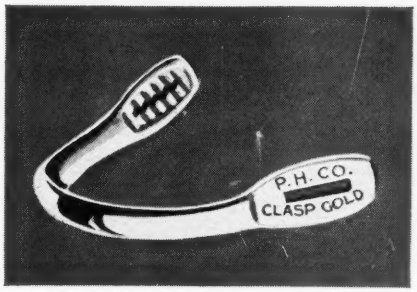

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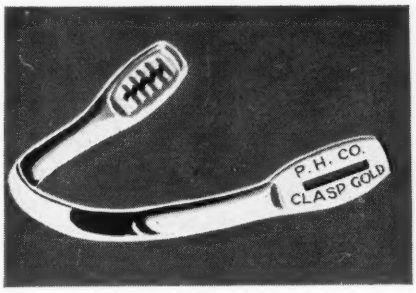

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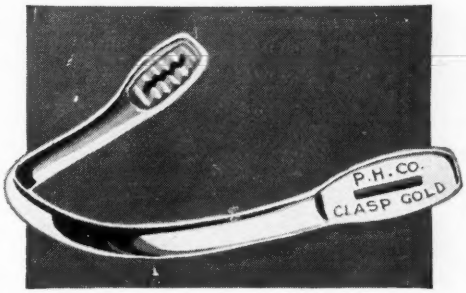

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